

ABSTRACT

Title of Dissertation: DISTRESS TOLERANCE AS A PREDICTOR
OF EARLY TREATMENT DROPOUT IN A
RESIDENTIAL SUBSTANCE ABUSE
TREATMENT FACILITY

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A large percentage of individuals entering residential treatment for substance abuse dropout of treatment early, often leading to subsequent relapse. Although a number of studies have investigated the predictors of treatment dropout, the particular characteristics that affect one's ability to cope with the initial stages of treatment and abstinence have not been addressed. As one line of research, the concept of distress tolerance, defined as one's ability to tolerate either psychological or physical distress, has been shown to be related to early lapse in abstinence attempts in illicit drug users, smokers, and gamblers. Although clearly applicable, the relationship between distress tolerance and early treatment dropout has yet to be examined. Thus, in the current study it was hypothesized that levels of distress tolerance would predict whether individuals dropout of treatment within 30 days. Specifically, 122 individuals entering a residential substance abuse treatment facility completed a battery of self-report measures assessing characteristics previously demonstrating a relationship with residential substance abuse treatment dropout, namely demographic variables, mood variables, levels of psychopathology, substance-use severity, social support, and

treatment readiness. Additionally, participants completed behavioral measures of psychological and physical distress tolerance. As hypothesized, logistic regression analyses indicated that psychological distress tolerance predicted early treatment dropout above and beyond relevant self-report variables. There was no relationship between physical distress tolerance and early treatment dropout. Implications for future studies and treatment development/modification are discussed.

DISTRESS TOLERANCE AS A PREDICTOR OF EARLY TREATMENT
DROPOUT IN A RESIDENTIAL SUBSTANCE ABUSE TREATMENT FACILITY

By

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Chapter 1: Theoretical Rationale

Introduction

In 2001, an estimated 19.5 million Americans, or 8.3 percent of the population aged 12 or older, had used an illicit drug at least once in the past month (SAMHSA, 2002a). Additionally, an estimated 9.4% of the Americans aged 12 or older met criteria for substance abuse or dependence. Users of heroin and cocaine appear to be especially susceptible to dependence, such that 53% of the individuals acknowledging past year use of heroin and 25.3% of individuals acknowledging past year use of cocaine were classified with dependence. This high prevalence of substance use in the United States has resulted in a number of costs to society. For instance, \$245.7 billion dollars were spent in 1992 on substance abuse assessment, prevention, and treatment, as well as costs associated with reduced job productivity or lost earnings, crime, and social welfare, with more than half of these costs associated with substance related crime(The Lewin Group, 1995).

Due to the high prevalence of illicit substance use and subsequent costs to society, a great deal of research in the past two decades has focused on the development and evaluation of effective treatments. Although evidence indicates that treatment does indeed lead to continued abstinence for a number of individuals (Gossop, Marsden, Stewart, & Treacy, 2002; Hubbard, Craddock, Flynn, Anderson, & Etheridge, 1997; Messina, Wish, & Nemes, 2000), a large percentage of individuals entering treatment for substance abuse either dropout of treatment early or relapse soon after treatment termination (Carmichael, Linn, Pratt, Ted, 1977; Crits-Christoph & Siqueland, 1996; Hubbard et al., 1997; Ravndal & Vaglum, 2002; Simpson, Joe, & Brown, 1997). This is

especially true in long term residential treatment which has the lowest rate of completion compared to other treatments. Indeed, according to a study of 26,603 individuals receiving long term residential treatment for substance abuse nationwide, only 29% of the individuals receiving treatment for cocaine or heroin abuse completed treatment, which was significantly lower than any other treatment modality (SAMHSA, 2002b). This low completion rate among individuals receiving residential treatment is especially alarming, given that treatment length appears to be one of the single most consistent predictors of positive long term outcomes across a number of studies (Gossop, Stewart, Browne, & Marsden, 2002; Hubbard et al., 1997; McCusker, Bigelow, Vickers-Lahti, Spotts, & Garfield, 1997; Simpson, Joe, & Brown, 1997).

For instance, Simpson, Joe, and Brown (1997) studied the role of treatment length on one-year follow-up outcomes within long-term residential treatment settings in the national Drug Abuse Treatment Outcome Study (DATOS). The groups were defined based upon “retention thresholds” that have been developed based upon large scale national treatment outcome studies. These studies have examined the distributions of average treatment durations for each treatment modality and evidence concerning the length of treatment necessary for clinical effectiveness (Shwartz, Mulvey, Woods, Brannigan, & Plough, 1997; Simpson, Joe, Broome, Hiller, Knight, & Rowan-Szal, 1997; Siqueland, Crits-Christoph, Gallop, 2002). The consensus among these studies for the length of treatment found to be necessary for clinical effectiveness, or the retention threshold, in long term residential treatment is 90 days. Among these clients, the individuals who stayed in treatment at least 90 days reported less frequent drug injections, cocaine-crack

use, heroin use, alcohol use, fewer arrests, and increased employment rates at one year follow-up.

Furthermore, Hubbard et al (1997) reported that treatment length was a significant predictor of treatment outcomes following residential treatment, such that reductions in substance use were greater for clients treated for more than 90 days. Specifically, more than 80% of weekly heroin and cocaine users treated for more than 3 months reduced their substance use in the follow-up year, as compared with 55% staying less than 3 months. Moreover, treatment length of 6 months or longer led to significant decreases in illegal activity and an increase in the likelihood of being employed full time. Carroll, Ziedonis, O'Malley, and McCance-Katz (1993) examined treatment length and abstinence in 150 cocaine abusers 12 months following residential treatment. Abstinent subjects had significantly more days in treatment than the nonabstinent subjects. Additionally, in a study examining the effect of substance abuse treatment completion on patients' subsequent employment and wages earned in the year following discharge, substance abuse treatment and wage data from 20,495 substance abuse treatment patients across three states were assessed. Within individuals receiving residential treatment, compared to individuals who dropped out of treatment, treatment completers were 22% to 49% more likely than non-completers to be employed and to earn higher wages in the year following treatment. Furthermore, patients staying in residential treatment longer than 90 days were 22% to 43% more likely to be employed in the year following treatment than those who stayed a shorter time (TOPPS-II Interstate Cooperative Study Group, 2003). Finally, in a study of 4,005 clients in 62 substance abuse treatment centers nationwide, Zhang, Friedmann, & Gerstein (2003) reported that the most substantial

long-term positive outcomes from increased treatment duration were observed among residential clients, compared to clients in other treatment modalities. In sum, it appears that substance-dependent patients with longer episodes of residential treatment experience better substance use and crime-related outcomes than do patients with shorter episodes (Crits-Christoph & Siqueland, 1996; Simpson, Joe, & Brown, 1997; Zhang, Friedmann, & Gerstein, 2003).

Given the evidence for the importance of treatment duration, it can be argued that in residential substance abuse treatment, dropout is more or less the outcome; such that treatments for substance abuse are considered effective to the extent they demonstrate the ability to retain patients (Carroll, 1997). Furthermore, in a summary of the findings from the National Drug Abuse Treatment Outcome Study (DATOS), Leshner (1997) stressed that although the results are promising, future research must investigate how to improve the rates of treatment dropout and to identify the lower bounds of retention that lead to effective treatment outcomes. There is also a need to examine the mechanisms of change that occur during treatment, as well as adequate ways to measure these mechanisms. In an attempt to better understand the mechanisms involved in residential treatment dropout, the following review will begin by defining the characteristics of residential treatment and then highlighting the main findings with regard to predictors of treatment dropout. It is of note that variability exists in the review section with regard to substance type. Although clear differences exist among individuals who use cocaine, heroin, and other substances (Conway, Kane, & Ball, 2003; Leri, Bruneau, & Stewart, 2003), there is some consensus that despite these differences, similar basic processes are occurring during an abstinence attempt (Marlatt & Gordon, 1985).

Residential Substance Abuse Treatment

Traditional forms of residential substance use treatment include community residential facilities, therapeutic communities, and community based residential substance abuse treatment alternatives to prison (Hiller, Knight, Leukefeld, & Simpson, 2002; Lang & Belenko, 2000; Messina, Wish, & Nemes, 2000; Moos & King, 1997). Settings vary with regard to single versus mixed gender and distribution of race, while the majority of settings including a wide range of ages (Craddock, Rounds-Bryant, Flynn & Hubbard, 1997). There also exists variability with regard to staff. While some facilities are staffed primarily with psychiatrists, psychologists, nurses, masters level therapists, and addiction counselors, others have a considerably smaller percentage of staff with specialized degrees. The majority of programs are highly structured with residents participating in group therapy sessions (i.e., relapse prevention, criminal thinking, AA/NA), individual therapy, life skills training, vocational and educational instruction, and on site jobs from early morning until the evening. Residents traditionally move through three stages of treatments; an orientation phase, a treatment phase, and a transition phase, where they receive increasingly more responsibilities and privileges as they move through each phase. Traditional therapeutic community techniques also include confrontation groups, including “pull ups” and “haircuts” where members of the community challenge each other with regard to their behavior and recovery process. Incentives for completing the program often include placement in stable housing, employment assistance, and ongoing psychiatric and substance abuse counseling.

Residential programs traditionally approach treatment from the disease model of addiction and emphasize the 12-step model. The philosophy in this type of program is

that reductions in substance use should come about following adoption of the 12-step philosophical system and engagement in the associated recommended behaviors of the approach. A key component to the 12-step system is a lifelong commitment to help preserve sobriety. Associated recommended behaviors include attending 12-step meetings, obtaining a sponsor, and staying away from the "people, places, and things" that trigger use. There is a strong emphasis on religion and the belief in a "higher power" in the recovery process. To a varying degree, residential programs also include some form of relapse prevention (Marlatt & Gordon, 1985). Relapse prevention is based upon the principles of social-learning theory (Bandura, 1977), such that addiction is thought to result from maladaptive habit patterns as opposed to only physiological responses to substance use. Thus, the overall goal of this approach is to teach individuals how to change their behavior, as well as to anticipate and cope with the problems that accompany a relapse. In this context, a relapse is defined as "a breakdown or setback in a person's attempt to change or modify any target behavior" (Marlatt & Gordon, pp. 3, 1985). Skills training, cognitive interventions, and overall lifestyle change procedures are the main components of relapse prevention programs. Specifically, clients are taught to recognize high risk situations (triggers), as well as the thoughts and feelings that lead to relapse. The counselors then work with the individual to challenge maladaptive thoughts and to generate alternative behaviors in response to specific triggers, thus increasing their ability to cope with these high risk situations. Although there is some variation in terminology, techniques, therapist training, and treatment length, all variants share the same theoretical approach.

Individual Predictors of Treatment Dropout

Demographic Variables

Age. In general, evidence suggests that younger clients are more likely than older clients to dropout from residential substance abuse treatment programs (Armenian, Chutuape, & Stitzer, 1999; Chou et al., 1998; Feigelman, 1987; Greenberg, Otero, & Villanueva, 1994; Lang & Belenko, 2000; Maglione, Chao, & Anglin, 2000; Siqueland, Crits-Christoph, & Frank, 1998). Stark (1992) argues that younger clients tend to be impulsive and lack the discipline to complete treatment. Furthermore, younger individuals are less likely to have family and/or community ties that would serve to increase support for treatment and decrease geographic mobility. It also makes conceptual sense that older individuals who have lived with the negative consequences of substance abuse and treatment failure for a longer period of time would approach treatment with more dedication. However, a number of studies have reported no association between age and the likelihood of completing treatment (Claus, Kindleberger, & Dugan, 2002; Robinson & Little, 1982), making it difficult to draw definitive conclusions regarding age and treatment dropout. *Race/ethnicity*

While some studies have reported that race has little effect on treatment dropout (McFarlain, Cohen, Yoder, & Guidry, 1977; Raynes & Patch, 1973; Sells, Chatham, & Joe, 1972), it has been suggested that Caucasians have higher completion rates than African Americans and Hispanics (Kleinman, Kang, Lipton, & Woody, 1992). In the majority of studies reporting differences in race/ethnicity, the role of race/ethnicity in dropout is not a primary aim, making it unclear from the results that these differences were not confounded by age, employment levels, or education levels. Furthermore,

having minority or majority status within a treatment program may be just as important of a factor as race/ethnicity itself (Brown, Joe, & Thompson, 1985, Sanson-Fisher, Poole, & Dunn, 1980). Thus, more controlled studies isolating age and race/ethnicity in treatment dropout studies and controlling for relevant variables such as education, employment, and minority status within treatment are needed.

Gender. With regard to gender, the findings appear to be equally inconclusive. While a number of studies suggest that males are more likely to drop out of treatment (Brewer, Zawadski, & Lincoln, 1990; Maglione, Chao, & Anglin, 2000; Ravndal & Vaglum, 1991), an equally large number of studies report that females are more likely to dropout (Arfken, Klein, di Menza, & Schuster, 2001; Baekland & Lundwall, 1975, Hughes, Coletti, Neri, & Urmann, 1995), while other report no differences (Nemes, Wish, & Messina, 1999; Stark & Campbell, 1988). Although empirical findings preclude definitive conclusions on the likelihood of dropout based upon gender, many argue that women are more likely to drop out based upon their more severe presentation of psychological distress, medical problems, fewer employment opportunities, lower income, increased parenting demands, and increased addiction severity at treatment admission (Coletti, Schinka, Hughes, & Hamilton, 1995; DeLeon, Melnick, & Schoket, 1993; Lundy, Gottheil, Serota, Weinstein, & Sterling, 1995; Marsh & Miller, 1985, Messina, Wish, & Nemes, 2000). In a recent study, Arfken and colleagues (2001) assessed gender differences in problem severity at assessment and 30-day dropout rates among 1803 individuals receiving publicly funded substance abuse treatment. Upon assessment, women reported significantly higher problem severity with a lower mean income, higher mean number of previous treatments, and higher scores on all domains of

the Addiction Severity Index (ASI) except for legal problems. Furthermore, women were significantly more likely to drop out of treatment within 30 days and to have a lower completion rate than men.

In contrast, Messina, Wish, and Nemes (2000) assessed 412 men and women entering therapeutic community treatments for substance abuse on demographic variables, substance use, Structured Clinical Interview for DSM-III-R Disorders (SCID-I and SCID-II), and other self report questionnaires. In line with previous difference found between men and women at assessment, significantly more of the women were diagnosed with depression or comorbid APD and depression, reported being physically and/or sexually abused, and to have received prior treatment. Significantly more of the men reported prior legal problems. Although the psychological differences between men and women are similar to the Arfken et al (2001) study, the women in this study were no less likely than the men to complete treatment, with approximately one third of the sample completing treatment among both genders.

Legal Status. It is hypothesized that individuals who are court mandated to treatment may be more likely to comply with and complete treatment to avoid being sent back to prison (Marlowe et al., 2001). Indeed, the findings with regard to legal status in the Maglione, Chao, and Anglin (2000) study are in agreement with others reporting that patients who are court mandated to treatment are somewhat more likely to comply with treatment programs and do just as well as patients who enter voluntarily (Collins & Allison, 1983; Lawental, McLellan, & Grissom, 1996; Ouimette, Finney, & Moos, 1997; Weisner, 1990).

Substance Use Severity

Evidence has pointed towards a positive relationship between higher levels of substance use, number of different substances used, and dropping out of treatment (Gainey, Wells, Hawkins, & Catalano, 1993; Kleinman et al., 1992; Stark, 1992; Westreich, Heitner, & Cooper, 1997). Recently, Maglione, Chao, and Anglin (2000) compared characteristics of methamphetamine users in residential treatment who completed at least 90 days of treatment versus those who left before 90 days. This threshold was picked based on previous studies suggesting that treatment duration of at least 90 days in residential treatment is indicative of significant positive outcomes in substance use behavior (Hubbard et al., 1997; Simpson et al., 1997). Individuals who reported more severe substance use, measured by frequency of use and route of administration, were significantly more likely to drop out of treatment. Specifically, only 26.1% of daily methamphetamine users completed 90 days of treatment, compared to 38.0% of those who used less than daily, and only 23.9% of injection users completed the 90 day threshold compared to 32.8% of non-injectors. Similarly, Ravndal and Vaglum (1991) examined the predictors of treatment completion among 144 19-40 year old substance abusers entering residential treatment. A total of 43 patients completed the 1-yr inpatient phase and 29 completed the total program. Substance use severity was significantly related to treatment completion, such that completers were characterized by a lower frequency of substance use prior to treatment than dropouts.

Comorbidity across Axis-I Psychopathology

A number of studies suggest that levels of psychiatric comorbidity are associated with dropping out of substance abuse treatment (Bell, Atkinson, Williams, Nelson, &

Spence, 1996; Brown et al., 1998; Hattenschwiler, Ruesch, & Modestin, 2001; Lang & Belenko, 2000; Ravndal & Vaglum, 1994). Hattenschwiler, Ruesch, and Modestin (2001) compared four groups of substance abusing residential patients with differing psychiatric comorbidity. Specifically, patients with substance dependence only, substance dependence plus schizophrenia, substance dependence plus affective disorders (depression and/or anxiety), and substance dependence plus personality disorder were compared on a number of treatment outcome variables. The individuals with substance dependence and comorbid affective disorders were the most difficult to treat in that they tended to relapse during their hospital stay and to leave the hospital prematurely. Thus, having a concurrent mood disorder in substance-dependent patients was found to increase the probability of dropping-out of treatment.

Lang and Belenko (2000) examined a number of predictors of treatment dropout in a residential substance abuse treatment alternative to prison program. A total of 150 felony offenders of low-level drug sale who were diverted from prison to a community based residential substance abuse treatment alternative were assessed on demographic, family, social, employment, medical, psychological, criminal, sexual behavior, substance use, and treatment histories. Treatment duration at this center ranged from 15 to 24 months. Dropouts were defined as individuals who voluntarily left the program as well as those who were terminated by the program due to disciplinary reasons (i.e., failed urine test, rule violations). Completers were defined as individuals who successfully finished the program. Overall, logistic regression analyses identified dropouts as being four times more likely to have a psychiatric history. Additionally, dropouts reported significantly more psychological problems with depression, anxiety, and controlling violent behaviors.

Bell et al (1996) measured levels of emotional functioning (i.e., self esteem, depression, and anxiety) during intake for 247 individuals entering a 30-day residential substance abuse treatment facility. Fifteen percent of the individuals dropped out of treatment, and compared to the treatment completers, dropouts had significantly higher levels of pretreatment anxiety and depression. Furthermore, decreases in levels of depression during the first two weeks of treatment was predictive of completing treatment, such that individuals who demonstrated decreases in depression were more likely to stay in treatment while those individuals who did not show improvements were more likely to dropout.

Finally, Ravndal and Vaglum (1994) explored the relationship between self-reported depression and treatment outcomes among 144 substance abusing clients in an 18 month therapeutic community program (residential treatment). Patients completed a structured interview and two self-report measures of current psychiatric symptomology (Millon Clinical Multiaxial Inventory (MCMI) and SCL-90). Sixty-nine percent of the patients were considered to be depressive cases at the time of the assessment. After one year of treatment, depression was a significant predictor of treatment dropout, such that individuals receiving a diagnosis of depression were five times more likely to dropout than their nondepressed counterparts.

Co-morbidity across Axis-II Psychopathology: Personality Disorders

In addition to Axis-I symptomology and diagnoses, chronic personality disturbances also may interfere with one's ability to complete treatment. For example, residents of a long-term residential treatment facility were assessed on neurocognitive and personality functioning (Fals-Stewart & Lucente, 1994). Findings indicated that

individuals with elevated scores on the antisocial personality scale of the Millon Clinical Multiaxial Inventory (MCMI-II) and who had cognitive impairments stayed in the program a shorter amount of time and were removed for rule violations significantly more often than the other residents. Similarly, Fals-Stewart (1992) reported that substance abusing patients with MCMI-II antisocial and avoidant profiles had shorter treatment durations in long-term residential treatment than patients with other elevated profiles. Greenberg, Otero, & Villanueva (1994) found a diagnosis of antisocial personality disorder to be predictive of dropout among 316 individuals in a dual diagnosis inpatient unit, while other demographic variable and Axis-I comorbidity were not associated with dropout. Finally, Sheppard, Smith, and Rosenbaum (1988) reported that of 86 alcoholic men in a residential alcoholism treatment program, those who dropped out scored significantly higher on scales of the Minnesota Multiphasic Personality Inventory (MMPI) suggesting the presence of sociopathic characteristics such as poor impulse control, interpersonal difficulties, and conflicts in relation to authority figures.

Social Support

Another area which has received empirical attention is level of social support, with researchers suggesting that a higher level of social support may be associated with individuals remaining in treatment. Dobkin, Civita, Paraherakis, and Gill (2002) assessed 206 patients in an outpatient treatment rehabilitation program on levels of social support upon intake. Treatment outcome variables assessed at 6 months included clinic attendance, relapse, amount of substance use, and urine tests. The findings indicated that levels of psychological distress and depression were higher at both assessment points for

patients with low social support. Level of alcohol and substance abuse and exposure to stressful life events were also higher in this group at 6 months. Furthermore, a higher level of social support was related to more days spent in treatment and higher rates of treatment completion. Finally, in the Lang and Belenko (2000) study, dropouts were identified as being less socially connected, having fewer close friends, and higher rates of problems with significant others.

However, Westreich, Heitner, and Cooper (1997) measured perceived social support among patients in a residential substance abuse treatment facility and reported evidence contrary to the notion that social support is positively related to treatment completion. A total of 66 patients were assessed on demographic, diagnostic, and perceived levels of social support upon admission into the treatment facility. Social support measures were also completed at 7, 14 and 21 days. A total of 46 patients completed the entire 21-day program, while 20 patients dropped out. Patients who were homeless and indicated an initial weak perceived social support from family were more likely to complete the program. Patients with stronger connections to shelter and/or family members were less likely to complete the program. Although findings suggest that social support may play a role in treatment dropout, further studies need to be conducted to clarify the importance of type (i.e., family, community) and perception of social support in keeping patients in treatment.

Treatment Readiness

Motivation has been found to predict both dropout and engagement in community-based treatment of substance abuse (De Leon & Jainchill, 1986; De Leon, Hawke, Jainchill, & Melnick, 2000; Simpson, Joe, & Rowan-Szal, 1997) across treatment

settings (Joe, Simpson, & Broome, 1998). One theory that attempts to explain the relationship between an individual's intent to change and their subsequent behavior is Prochaska and DiClemente's (1982, 1983) transtheoretical model of change (TTM). In this model, behavior change is conceptualized as a process that unfolds over time and involves progression through a series of six stages: precontemplation, contemplation, preparation, action, maintenance, and termination. They argue that at each stage of change, different processes of change optimally produce progress. Thus, matching change processes to the respective stages requires that the therapeutic relationship be matched to the client's stage of change. According to Prochaska and DiClemente (1983), individuals in the *precontemplation* stage are the most resistant to change and are characterized as processing less information about their problems, engaging in less personal evaluation, and experiencing fewer emotional reactions to their substance use. Individuals who are aware of their problem and weigh the positive and negative consequences of their actions are in the *contemplation* stage. Individuals in the *preparation* stage have made a decision to take action within the next month, while individuals in the *action* stage are currently taking steps such as changing their behavior, environment, or experiences. Finally, individuals in the *maintenance* stage are learning and engaging in behaviors that will prevent relapse.

A number of studies have suggested that one's stage upon entering treatment may predict treatment dropout (Prochaska, Norcross, Fowler, Follick, & Abrams, 1992), attendance (Prochaska, Velicer, DiClemente, & Faval, 1988), and outcome (Heather, Rollnick, & Bell, 1993). In a representative study, Joe, Simpson, and Broome (1998) examined client motivation as a predictor of dropout and engagement in therapy in the

DATOS study. The dependent variable, dropout, was defined as whether or not clients stayed in treatment at least 90 days. The motivation scales included problem recognition (PR), desire for help (DH), and treatment readiness (TR), which were taken from the Circumstances, Motivation, Readiness, and Suitability scale (CMRS; De Leon & Jainchill, 1986). The authors reported that treatment readiness significantly predicted 90-day dropout in long term residential treatment ($n = 2265$). Additionally, after including demographics and background information, pre-treatment motivation remained the most important predictor, such that an increase in one unit on a three point scale doubled the odds of a client remaining in treatment for at least 90 days. Finally, treatment readiness was positively correlated with each of the treatment process scales. The authors argue that this information is important because if level of motivation is identified prior to treatment, an opportunity is provided to 1) select a treatment that is most in line with an individuals current level of motivation or 2) target motivation level prior to treatment if more advanced treatment approaches are utilized.

Despite supportive findings, contrary findings also have been provided (Blanchard, Morgenstern, Morgan, Labouvie, & Bux, 2003; Hutchison, 1996; Willoughby & Edens, 1996). For example, Blanchard, Morgenstern, Morgan, Labouvie, and Bux (2003) examined the predictive validity of the stages of change constructs to treatment outcome in a sample of 252 treatment seeking substance users. In this study, the authors used the University of Rhode Island Change Assessment Scale (URICA; McConaughy, Prochaska, & Velicer, 1983), which is a widely used measure for assessing readiness to change that provides a continuous measure of the precontemplation, contemplation, action, and maintenance stages. Preliminary analyses in

this study indicated that the URICA yields two clusters in this population: a) one consisting of high scores on precontemplation and low scores on contemplation, action, and maintenance; and b) one consisting of low scores on precontemplation and high scores on the other three stages. In the second part of the study, the authors used multiple regression analyses to examine the predictive validity of the two clusters to treatment outcome variables. Neither cluster predicted any index of success including treatment dropout, percent days abstinent (PDA), and negative consequences of substance abuse at the end of treatment. The authors suggest that to date there appears to be a lack of empirical evidence for the predictive validity of the stages of change, arguing against its clinical utility in treatment settings. Specifically, although clinicians and researchers agree that stage of change is a very appealing heuristic and has good face validity, it has inconsistent empirical support in predicting future behavior, questioning its ability to predict who is at risk of dropping out of treatment and subsequently relapsing. Despite this critical interpretation, other factors could have influenced the results and limited the predictive validity of the stages of change model. For instance, stage of change is very fluid and may change throughout treatment, making it difficult to make predictions at the start of treatment. Additionally, while some studies that have reported predictive validity of the stages of change measured readiness in terms of behavioral intentions to change (e.g., Hall, Havassy, & Wasserman, 1991; Heather et al., 1993), others have measured attitudes and beliefs about change. Actual behavior may be more predictive than attitudes and beliefs. As such, further investigation into the appropriate measurement of stages of change as well as variability in stage of change throughout treatment may provide needed guidance in understanding the utility of this construct.

Predictors of Treatment Outcome Studies: Summary and Conclusions

Although the available research suggests a link between long-term treatment outcome and treatment dropout, it is difficult to draw strong conclusions regarding the individual mechanisms responsible for treatment dropout among individuals entering substance abuse treatment. Those that demonstrate the most consistency appear to be levels of psychiatric comorbidity and substance use severity. Other predictors that show initial evidence of predicting a client's ability to stay in treatment include age, social support, and treatment readiness. However, findings continue to be inconclusive. Given the importance of treatment duration, focusing on identifying the mechanisms involved in one's attempt to persist through the difficult early stages of a quit attempt may provide the needed guidance for understanding treatment dropout. As such, research in other areas of substance abuse (e.g., use, relapse) may provide guidance in understanding the mechanisms involved in treatment dropout.

Stress as a Factor in Substance Use and Relapse

Although not yet studied as a predictor of treatment dropout, stress levels have been implicated in substance use, substance cravings, and relapse (Carroll et al., 1993; Doherty, Kinnunen, Militello, & Garvey, 1995; Elman et al., 1999; McLellan, 1983; Mulvaney, Alterman, Boardman, & Kampman, 1999; Tennant, Shannon, Nork, & Sagherian, 1991). A number of theoretical models have implicated stress in substance abuse. With regard to substance use, Wills and Hirky (1996) propose that the use of addictive substances (i.e., cigarettes, alcohol, illicit drugs) is a coping mechanism to increase positive affect and decrease negative affect. Similarly, Khantzian's (1985) self medication hypothesis suggests that individuals use substances to alleviate emotional

distress and enhance mood, and that this desire to enhance mood increases during stressful states. Finally, Sinha (2001) proposed that a maladaptive stress response mediates the increased frequency of substance use to abusive levels in vulnerable individuals who are exposed to stress. Specifically, key individual characteristics of the maladaptive stress response model include high or low reactivity and sensitivity to stress stimuli, a slow recovery to baseline after stress exposure, and poor behavioral and cognitive coping. Chronic substance abuse leads to neuroadaptations in brain stress and reward circuits which in turn promote maladaptive stress responding during stress, thereby contributing to continued chronic substance use. Consequently, this model predicts that increasing adaptive coping responses to stress would reduce stress vulnerabilities and the risk of further substance abuse.

With regard to relapse, Marlatt and Gordon's (1985) relapse prevention model points to common processes occurring with regard to negative affect, stress, and coping responses during the initial stages of a quit attempt. In line with a relapse prevention perspective, it is suggested that individuals who are unable to effectively tolerate the emotional distress that accompanies a quit attempt will more likely be faced with negative affect and increased perceived stress. As such, increased negative affect and perceived stress, coupled with an inability to respond with an effective coping response, may lead to early treatment dropout and subsequent relapse.

While theoretical models implicate stress in substance use and relapse (Khantzian, 1985; Marlatt & Gordon, 1985; Sinha, 2001), and empirical evidence supports this relationship (e.g., McKay, Alterman, Mulvaney, & Koppenhaver, 1999), there currently exists no empirical evidence that levels of stress are directly related to treatment dropout.

However, there is evidence that stress levels are related to substance cravings and coping skills, which are subsequently associated with relapse. Given this relationship, it may not be the level of stress that one is subjected to, but more their ability to effectively cope and/or tolerate stress, that is directly related to one's ability to complete treatment. Entering residential treatment for substance abuse is accompanied by a number of stressors including increased structure, loss of freedom, separation from friends and family, and abstinence. Given that all individuals are faced with these adjustments, identifying the individual characteristics that differentiate those individuals who persist through these stressors to complete treatment and those who don't may provide the much needed guidance in understanding the role of stress in treatment dropout.

Preliminary Studies on the Concept of Distress Tolerance

One of the most recognized attempts to conceptualize one's ability to persist through stressful situations is in the area of borderline personality disorder (BPD; Linehan, 1993). Specifically, theoretical accounts of the disorder suggest that BPD is characterized by a range of behaviors that function to immediately reduce intense negative affect (Linehan, 1993). Indeed, individuals with BPD commonly report that a primary reason for parasuicidal and suicidal behavior is relief from negative emotions (e.g., Brown, Comtois, & Linehan, 2002). The ability to withstand this intense negative affect without resorting to anger, dissociation, impulsive behaviors, and self-harm has been defined as *distress tolerance* (Linehan, 1993). While low levels of distress tolerance are theorized to increase parasuicidal behavior and emotion dysregulation in BPD, it could be argued that substance use serves the same function in substance dependent individuals. Specifically, when faced with distress, individuals who previously used

substances as a coping mechanism to decrease stress and negative affect may turn to this option when unable to handle distress during treatment, thus leading to premature treatment termination and subsequent relapse. As such, it can be hypothesized that substance users as a group have lower levels of distress tolerance than the general population because of their dependence on substances to manipulate affective states, with individuals unable to complete treatment evidencing even lower levels of distress tolerance.

Although yet to be applied to illicit drug use, several researchers have identified a relationship between one's ability to tolerate emotional and/or physical distress and length of abstinence from cigarette smoking. Taking an approach based upon Eisenberger's (1992) learned industriousness theory, Quinn, Brandon, and Copeland (1996) argued that individuals with low persistence (distress tolerance) in the face of distress are particularly attracted to the immediate reinforcement of substances, the use of which would symbolize a lack of persistence. Learned industriousness theory states that the amount of effort an individual exerts is dependent on the degree of aversiveness associated with the effort on the specific task, and this level of aversiveness is a function of prior learning history. Specifically, a history of reinforcement for low effort will likely lead to high effort being aversive, and a history of reinforcement for high effort would lead to experiencing high effort as less aversive. Thus, the reinforcement for high effort should generalize across behaviors, leading to a greater probability of high effort in the future, and vice versa. Following from this theory, Quinn, Brandon, and Copeland (1996) assessed 52 heavy smokers and 57 nonsmokers on two behavioral persistence tasks. On the first task, the anagram persistence task (APT), subjects were presented with

21 anagrams on separate cards. The subjects were instructed to move onto the next anagram after they complete a card or give up. After three minutes on any card they were told to proceed to the next anagram. Persistence was measured as average time spent on all unsolved anagrams. On the second task, the mirror-tracing persistence task (MTPT), subjects were required to trace the outline of eight geometric figures while viewing it through a mirror. This task has been used previously to increase stress, pulse rate, and blood pressure (Matthews & Stoney, 1988; Tutoo, 1971). Similar to the APT, subjects were instructed to move on after they have successfully completed a figure or if they give up. Subjects were given five minutes on each figure before being instructed to move on. Again, persistence was measured as average time spent on all uncompleted drawings. Subjects were also assessed on cognitive ability, levels of drug and alcohol use, and positive and negative affect. Smokers evidenced significantly higher levels of negative affect, drug, and alcohol use. However, as predicted, nonsmokers were more persistent than smokers on the APT and MTPT (p 's < .001), even after controlling for each of the above mentioned measures. Further, individuals with substance abuse histories tended to be less persistent than individuals without such histories even after controlling for smoking status, supporting the theory that substance users evidence lower levels of distress tolerance than the general population.

Given the relationship found between low levels of distress tolerance and substance use in the Quinn et al (1996) study, Brown, Lejuez, Kahler, and Strong (2002) theorized that similar processes may be occurring in the context of a quit attempt. They hypothesized that smokers who are unable to succeed in a smoking cessation attempt would evidence lower levels of distress tolerance than those who succeed. Specifically,

Brown et al (2002) examined 16 current smokers who had failed to sustain any previous quit attempt for more than 24 hours (immediate relapsers) and 16 smokers with at least one sustained quit attempt of three months or longer (delayed relapsers). The participants were exposed to psychological (mental arithmetic) and physical (CO₂ inhalation/breath holding) stressors. Relative to delayed relapsers, immediate relapsers were characterized by higher baseline levels of affective vulnerability, greater levels of dysphoria and urge to smoke following 12-hour nicotine deprivation, and less task persistence on the stressors, suggesting that low levels of distress tolerance and negative affect may be risk factors for early lapse in the context of quitting smoking.

Following from this study, Brandon et al (2003) assessed the predictive ability of persistence on behavioral tasks to relapse following treatment for smoking. One hundred forty-four smokers were assessed on cognitive ability, negative affect, and persistence using the APT and MTPT just prior to commencing smoking cessation treatment. The subjects were broken down into three groups, treatment non-completers, those who completed treatment but relapsed back to smoking (lapsers), and those who sustained abstinence until follow-up (abstainers). The MTPT was found to be a significant predictor of sustained abstinence while the APT was not. Mean persistence times on the MTPT increase monotonically across nonsmokers, abstainers, and lapsers. Level of smoking and gender also predicted sustained abstinence, such that heavier smokers and women were significantly more likely to lapse sooner. In a multivariate analysis, MTPT continued to significantly predict sustained abstinence even after controlling for smoking severity and gender among both intent to treat and treatment completers.

It is also of note initial findings in a study on pathological gamblers provided support for the concept of distress tolerance as a predictor of treatment failure across addictions (Daughters et al., 2004). Specifically, 16 current pathological gamblers who had at least one sustained period of gambling abstinence lasting a minimum of 3 months (i.e., delayed relapsers) and 16 current pathological gamblers who had never remained abstinent for a period longer than 2 weeks (i.e., immediate relapsers), were assessed for baseline levels of negative affect and stress reactivity, as well as faced with a psychological (mental arithmetic) and physical (breath holding) stressor. Compared to the delayed relapsers, the immediate relapsers displayed higher levels of negative affect and stress reactivity. Immediate relapsers also were less likely to persist on the psychological stressor, suggesting that negative affect, stress reactivity, and low levels of psychological distress tolerance play an important role in one's ability to persist in an abstinence attempt.

Given the findings that distress tolerance is related to one's ability to persist in a prior abstinence attempt in both smoking and gambling, it would appear logical to hypothesize that similar processes are occurring with illicit drug abusers. Although the specific concept of distress tolerance has not yet been applied in the area of drug abuse, there exists related literature that implicates stress in drug cravings, drug use, and relapse (Sinha, 2001). Given these findings, one might hypothesize that those individuals who are unable to employ effective coping strategies in order to persist through an emotional and/or physically distressing situation may also be less likely to persist through treatment. As such, Study 1 (Daughters, Lejuez, Kahler, Strong, & Brown, in press) employed a

retrospective design to test the relationship between levels of psychological distress tolerance and the duration of one's most recent abstinence attempt.

Chapter 2: Distress Tolerance and Duration of Most Recent Abstinence Attempt among Residential Treatment Seeking Substance Abusers

Method

Participants

Participants included 89 substance abusers residing in the Salvation Army Harbor Lights residential substance abuse treatment facility in Northeast Washington DC. Treatment at this center involves a mix of strategies adopted from Alcoholics and Narcotics Anonymous as well as group sessions focused on relapse prevention and functional analysis. The center requires complete abstinence from drugs and alcohol, with the exception of nicotine; regular drug testing is provided and any use is grounds for dismissal from the center. Typical treatment lasts between 30 and 180 days and aside from scheduled activities (e.g., group retreats, physician visits) residents are not permitted to leave the center grounds during treatment.

For inclusion, all participants had to report using cannabis, alcohol, cocaine, stimulants, sedatives, opiates, hallucinogens (other than PCP), PCP, or inhalants on at least a weekly basis prior to coming to treatment; no potential participants failed to meet this inclusion criteria. Additionally, participants had to identify at least one previous serious abstinence attempt; 5 potential participants were excluded based on this criterion. The mean age of the sample was 39.2 years ($SD = 9.4$), with 62.9% and 89.9% of the sample being male and African American, respectively. With regard to highest education level, 34.8% did not complete high school or receive a GED, 42.7 completed high school or received a GED, and 22.5% attended at least some college or technical school. Each

week names were randomly selected from the facility and each individual in the facility over the six weeks of data collection was given an opportunity to participate in the study. On average, 10 to 20 participants were assessed each week. Participants were paid between \$5 and \$15 depending on their performance on the challenge procedures.

Procedure

Sessions were conducted in two classrooms at the treatment facility. One classroom was designated for completion of questionnaires and was equipped with desks for the participants and the second room was reserved for PASAT administration. At the beginning of the session participants were given a detailed explanation of the procedures and asked to provide written informed consent. Participants were actively encouraged to seek assistance regarding questions that were unclear. Participants were informed that they would be paid between \$5 and \$15 at the end of the session, and the amount would be dependent upon their task performance to provide a mild incentive for persistence on the tasks.

Measures

The participants were given questionnaires assessing standard demographic information, dysphoria, history of drug and alcohol use, and number of days of their most recent serious abstinence attempt prior to treatment (not counting detoxification). While filling out the questionnaires, participants were randomly selected to complete the psychological stressor. In addition to measures of distress tolerance, assessment of demographic, mood, and substance use variables were used as they have been shown to be associated with substance use relapse.

Dysphoria. In line with Brown et al. (2002), we measured dysphoria using a four item scale consisting of self-reported anxiety, difficulty concentrating, irritability, and frustration, with each items independently rated on a 100 point Likert scale, with a total score derived by summing the score on each item. Reliability of this dysphoria scale was acceptable ($\alpha = .77$). A baseline administration of the scale occurred at the start of the session and an experimental administration occurred during the psychological stressor (see below for details).

Level of Substance Use. A composite score of level of substance use was created by summing frequency of use in the past year prior to their current treatment from the following nine categories of substances: (a) cannabis, (b) alcohol, (c) cocaine, (d) stimulants, (e) sedatives, (f) opiates, (g) hallucinogens (other than PCP), (h) PCP, and (i) inhalants.

Psychological Stressor: PASAT. Similar to Brown et al. (2002), we used a modified computerized version of the Paced Auditory Serial Addition Task (PASAT; Lejuez, Kahler, & Brown, 2003), which has been shown to increase subject stress levels (Deary et al., 1994). For this task, numbers were sequentially flashed on the screen, and participants were asked to add the presented number to the previously presented number before the subsequent number appeared on the screen. Previous studies have required participants to provide answers by using the mouse to click on the correct answer on a number pad displayed on the screen. Due to limited computer proficiency in the current sample, however, participants provided answers verbally. The task consisted of three levels with varying latencies between number presentations. Specifically, the first level of the PASAT provided a 3-s latency between number presentations (i.e., low difficulty), a

2-s latency during the second level (i.e., medium difficulty), and a 1-s latency during the final level (i.e., high difficulty). The first level lasted for 3 min and the second level lasted for 5 min. Following a 2-min brief rest period, the final level continued for up to 7 min, with the subject having a termination option. Specifically, participants were informed that once the final level had begun they could terminate exposure to the task at any time by informing the experimenter.

Distress tolerance was indexed as latency in seconds to task termination. The experimental administration of the dysphoria scale occurred at the end of the second level of the PASAT to determine if the task increased psychological stress. This second administration occurred at the end of second level as opposed to the end of the task to prevent confounds associated with termination latency. Further, number of correct responses on the first two levels were assessed to control for the effects of skill on persistence.

Results

Table 1 indicates use of each drug class over the past year including any use and weekly use. Further polysubstance use was common in the sample, with 23.6% of the sample using 2 substances on a weekly basis, 23.6% using 3 substances on a weekly basis, and 13.5% using 4 or more substances on a weekly basis. Duration of last abstinence attempt ranged from 1 to 4440 days, with a median of 46. For analysis purposes, this variable was log-transformed to correct for positive skewness thereby limiting the impact of extreme durations. Average termination latency for the PASAT was 217.8 s ($SD = 153.8$), with 72.3% terminating the task prior to the seven minute maximum duration. Paired t-tests indicated a significant increase in dysphoria at the

experimental administration of the scale [$t(1) = 8.08, p < .001$], suggesting that the task was psychologically stressful.

No relationships were found among PASAT termination latency, age, gender, education level, dysphoria (baseline or change from baseline to experimental), and level of substance use. Only PASAT termination latency was related to length of previous abstinence attempt, which was positive and significant as hypothesized ($r = .27; p = .01$). To examine the unique relationship between PASAT termination latency and length of previous abstinence attempt, we conducted a regression analysis adding age, gender, education level, baseline dysphoria, and level of substance use in a first step and PASAT termination latency in a second step. Results indicated that PASAT remained significantly associated with length of previous quit attempt after controlling for these variables ($B = .002, SE = .001; R^2\Delta = .06, p = .02$).

Table 1. Percentage of sample in Daughters et al. (in press) acknowledging any use or weekly use among each drug type in the past year.

Drug Class	Acknowledging Any Use	Acknowledging Weekly Use
Alcohol	85.4 %	55.1 %
Marijuana	61.7 %	30.4 %
Stimulants (other than cocaine)	15.7 %	02.2%
Crack/Cocaine	71.9 %	55.0 %
Opiates	52.8 %	38.2 %
Hallucinogens (other than PCP)	28.1 %	07.8 %
PCP	42.7 %	18.0 %
Sedatives	22.5 %	09.0 %
Inhalants	05.6 %	01.1 %

Chapter 3: Discussion and Aims of the Proposed Study

The results of Study 1 suggest that levels of psychological distress tolerance may play a significant role in one's ability to abstain from substance use during an abstinence attempt. Although individuals in this study were currently receiving residential treatment, only previous abstinence duration was assessed to examine the general relationship between substance abuse, abstinence, and distress tolerance. Given the importance of length of treatment on predicting long term treatment outcomes, it will be important to extend these findings and examine the relationship of distress tolerance to abstinence during the early stages of treatment. Thus, the following study attempted to provide a more stringent test of the relationship between distress tolerance and one's ability to persist through the difficult early stages of residential substance abuse treatment. Specifically, it was hypothesized that lower levels of distress tolerance place individuals at an increased risk for treatment dropout. Although not assessed in Study 1, there exists evidence that physical distress tolerance may play a role in one's ability to abstain from substance use (Brown et al., 2002). As such, this variable was included in the current study. Furthermore, in order to substantiate the construct validity of psychological and physical distress tolerance, two behavioral measures of each construct were included (Campbell & Fiske, 1959; Kazdin, 2003). Additionally, given the findings from previous studies examining predictors of residential substance use treatment dropout, demographics variables, mood variables, psychopathology, substance use severity, treatment readiness, and social support were also assessed. Specifically, substance abusers entering a residential treatment facility completed a battery of self report measures and were assessed for levels of psychological and physical distress tolerance

within their first week of treatment. Although a larger, future goal will be to follow clients long term to examine continued abstinence following treatment, emphasis is placed in this study on ability to complete the first month of residential treatment because of the importance of completing this step in the larger goal of abstinence.

Specifically, it was hypothesized that:

- Moderate to high correlations will result within the psychological (PASAT and MT) and physical (CP and BH) distress tolerance measures, with low to moderate correlations across these two constructs.
- Dropouts, as compared to completers would evidence lower levels of psychological distress tolerance as indexed by persistence on the PASAT and MT tasks.
- Dropouts, as compared to completers would evidence lower levels of physical distress tolerance as indexed by persistence on the cold pressor and breath holding tasks.
- Dropouts, as compared to completers, will evidence higher levels of psychopathology, negative mood, and substance use severity, and lower levels of social support and treatment readiness.

Distress tolerance will predict treatment dropout above and beyond the effects of demographics, psychopathology, mood variables, substance use severity, social support, and treatment.

Chapter 4: Method

Participants

Participants for this study included 128 individuals who entered the Salvation Army Harbor Light residential substance abuse treatment facility located in Northeast Washington, DC. Six individuals were found to meet DSM-IV criteria for psychosis and thus were excluded from further analysis. In the final sample ($n = 122$), the mean age of the sample was 40.3 years, with 70.5% and 95.1% being men and African American, respectively. Additionally, 3.3% were Caucasian, 0.8% were Hispanic/Latino, and 0.8% reported other. In terms of highest education level, 5.7% reported finishing 8th grade or less, 21.3% reported finishing some high school, 43.4% reported a high school degree or GED, 20.5% reported some college or technical school, 2.5% reported a college degree, and 6.6% reported having attended graduate school or obtained a graduate or professional degree. Amount of substance use in the past year across drug classes for the entire sample is presented in Table 2. Substances used weekly the most frequently in the past year included cannabis (27.0% of participants), alcohol (41.0%), cocaine (60.7%), and heroin (27.9%). Participants signed a contract upon entrance into the facility stating how many days they would be in treatment. Intended treatment length ranged from 30 days (45.1% of participants), 60 days (6.6%), 90 days (23.0%), or 180 days (25.4%).

Procedure

Residents were required to have been abstinent from any drug use for at least 3 days prior to entering the treatment facility. Urine samples were collected by the treatment center upon entrance into the facility for verification. Residents at the treatment center were approached within one week of their arrival date and were asked if they

would be willing to participate in a study examining how substance abusers handle stressful situations. The average length of time between arrival to the facility and participation in the study was 2.6 ($SD = 1.8$) days. They were told that the session would last approximately 2 hours and that they would be paid between \$5 and \$15 depending on their performance on the challenge tasks.

Each assessment session was held on either a Tuesday evening or Friday afternoon in a classroom at the Salvation Army Harbor Lights facility. At the beginning of the session the participant was given a more detailed explanation of the procedures and asked to provide written informed consent. Given issues of reading comprehension, efforts were made to insure that participants understand all facets of the consent form and the study itself. Next, the subjects completed a battery of 10 questionnaires assessing demographics, treatment history, substance use history, mood states, impulsivity, social support, and treatment readiness. The order of measures in each packet was randomized except for the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988), which was always administered first in order to get a baseline measure of positive and negative mood before the challenge procedures were administered.

While the participants were completing the questionnaires, individuals trained in administering the laboratory challenge tasks took participants one by one into an adjacent room where they completed the tasks. The tasks, described below in detail, included psychological (i.e., PASAT, mirror-tracing) and physical (i.e., Cold Pressor, breath holding) stressors. Two measures of each construct were used to establish convergent validity regarding the physical and psychological distress tolerance constructs, in line with suggestions by Kazdin (2003) and Campbell and Fiske (1959). Given the significant

relationship between persistence on the mirror tracing task and abstinence in the Brandon et al. (2003) study, a computerized version of the mirror tracing task was developed for this study (see below). The order of completion of the challenge tasks were counterbalanced across participants. Each participant was reminded before the task that the better they perform on the task the more money they will earn.

In addition to the questionnaires and challenge tasks, Structured Clinical Interviews for DSM-IV Axis-I Disorders (SCID-IV; First, Spitzer, Gibbon, & Williams, 1997) were conducted. Individuals trained in administering the SCID-IV took participants one by one into a private room to complete the interview. In between completion of the challenge tasks and clinical interview the participant returned to the classroom to finish completing the questionnaires. A proctor was in the classroom at all times to provide instruction and answer any questions the participants may have had. Once the participants completed each aspect of the assessment session (i.e., questionnaire packet, challenge tasks, clinical interview), they were told how much money they had earned and then signed a receipt. Any individual who completed at least one of the challenge procedures without quitting received the entire \$15. If an individual failed to persist through any of the challenge procedures they received \$10. The money was deposited in their personal accounts at the Salvation Army Harbor Lights facility on the next business day. In total, the entire session lasted about 2 hours. Following the assessment day, participants' treatment information including entry date, total number of expected days in treatment, exit date, and reason for leaving the facility was followed-up by contact with the administrative offices of the treatment center.

Self Report Measures

Demographic Variables

Participants provided basic demographic information including age, gender, education level, occupation, and socioeconomic status.

Assessment of Psychopathology

The Structured Clinical Interview for DSM-IV (SCID-IV; First, Spitzer, Gibbon, & Williams, 1997) was administered to assess for Axis-I psychopathology and Borderline Personality Disorder and Antisocial Personality Disorder. Interviews were conducted by trained graduate research assistants. Individuals who met criteria for psychosis were excluded as this may have affected their responses on the self report measures and performance on the challenge procedures. The SCID is a measure with demonstrated reliability (Williams, Gibbon, First, & Spitzer, 1992).

Mood Measures

A number of self report questionnaires were administered to assess whether baseline levels of negative affect are related to levels of distress tolerance and/or treatment dropout.

Dysphoria. In line with Brown et al. (2002), we measured dysphoria using a four item scale consisting of self-reported anxiety, difficulty concentrating, irritability, and frustration, with each items independently rated on a 100 point Likert scale, with a total score derived by summing the score on each item. Reliability of this dysphoria scale was acceptable ($\alpha = .69$). A baseline administration of the scale occurred at the start of the session and an experimental administration occurred during the psychological stressor.

Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). This 20-item measure was used to assess differences in current positive and negative mood. This scale was always administered at the beginning of the session to control for confounds from the assessment session (i.e., challenge procedures). The scale assesses both positive (PA) and negative (NA) affect. PA reflects the extent to which a person feels enthusiastic, alert, and active. NA reflects a person's subjective distress and encompasses a number of negative mood states including anger, contempt, disgust, and guilt. NA is related to self-reported stress and poor coping (Clark & Watson, 1988) and frequency of unpleasant events (Stone, 1981). The PANAS was tested on an undergraduate population and participants were asked to rate how they felt during six different time frames. The measure demonstrated high internal consistency, with alpha reliabilities ranging from .86 to .90 for PA and from .84 to .87 for NA for each time frame. The two scales are largely uncorrelated ($r = -.12$ to $-.23$) and have adequate test-retest reliability. It has also shown strong discriminant and convergent validity. Reliability of this scale in the current study was high ($\alpha = .89$).

Center for Epidemiological Studies – Depression Scale (CES-D; Radloff, 1977). This scale was used in the present study to assess differences in depressive symptoms. The CES-D is a short self-report scale designed to measure depressive symptomatology in the past two weeks in the general population. The focus of the scale is on affective components of depressive symptomatology and includes depressed mood, feelings of guilt and worthlessness, feelings of helplessness and hopelessness, psychomotor retardation, loss of appetite, and sleep disturbance. High internal consistency was demonstrated in the general (Chronbach's $\alpha = .85$) and patient (Chronbach's $\alpha = .90$) populations. Six month

test-retest reliability on individuals reporting no negative life events was adequate ($r = .54$). Discriminant validity was high between psychiatric inpatients and the general population and moderate among levels of severity within patient groups (Radloff, 1977). Reliability of this scale in the current study was acceptable ($\alpha = .76$).

Stress Reaction

A measure of stress reaction was used to determine its relationship to the distress tolerance measures as well as treatment dropout. Specifically, the *Multidimensional Personality Questionnaire – Stress Reaction Subscale (MPQ-SR; Tellegen, 1982)* was used. This measure was used to assess individual differences in stress reactivity. The MPQ is a self-report measure that represents 11 primary personality dimensions and 3 higher order traits: (1) Positive Emotionality, (2) Negative Emotionality, and (3) Constraint. The measure has high internal consistency ($\alpha = .85$) and high 30-day test re-test reliability ($r = .89$). The MPQ has strong psychometric properties and good behavioral genetic data from twin studies (Tellegen et al., 1988). One of the MPQ primary trait scales, Stress Reaction, represents a direct counterpart to negative emotional disposition (Tellegen, 1982). The Stress Reaction subscale has demonstrated high internal consistency ($\alpha = .90$). Reliability of this scale in the current study was good ($\alpha = .84$).

Impulsivity

A measure of impulsivity was used to determine if quitting a challenge task prematurely or dropping out of treatment was related to levels of impulsivity. Specifically, we used the *Eysenck Impulsiveness Scale* (Eysenck, Pearson, Easting, & Allsopp, 1985) to assess trait-like levels of impulsive behavior across cognitive and behavioral domains. Representative items include “Do you usually make up your mind

quickly” and “Do you often do things at the spur of the moment.” The 19-item subscale (scores range from 0 to 19, with higher scores indicating higher levels of impulsivity) has demonstrated good internal consistency with an alpha coefficient equaling .84. Reliability of this scale in the current study was acceptable ($\alpha = .76$).

Substance Use

A measure of past year substance use severity and smoking severity were administered to control for the effects of substance use.

Substance Use Questionnaire. Polydrug use was assessed with a standard substance use questionnaire (e.g., Babor & Del Boca, 1992; Grant, Contoreggi, & London, 2000) to control for the effects of drug type. Specifically, participants were asked if they had ever used a particular substance in their lifetime, how often they used it in the past year prior to treatment, and how often they used the substance during the period of their life when they were using it most frequently. Participants answered the latter two questions on a 6-point scale ranging from “never”, “one time”, “monthly or less”, “2 to 4 times a month”, “2 to 3 times a week”, and “4 or more times a week.” The substance categories include: (a) cannabis, (b) alcohol, (c) cocaine, (d) MDMA, (e) stimulants, (f) sedatives, (g) opiates, (h) hallucinogens (other than PCP), (i) PCP, (j) inhalants, (k) and nicotine. Weekly substance use was calculated by adding the number of drug classes used on a weekly basis in the past year.

Fagerstrom Test for Nicotine Dependence (FTND; Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991). Given the significant relationship found between distress tolerance and smoking (Brown et al., 2002; Brandon et al., 2003), nicotine dependence was assessed and controlled for using the revised version of the FTND. This short, self-

report measure of nicotine dependence consisting of six multiple-choice questions. The alpha coefficient for the revised FTND has been shown to be adequate (0.61), and was a significant improvement over the FTQ (average reported reliability = 0.51; Heatherton et al., 1991). Reliability of this scale in the current study was acceptable ($\alpha = .60$).

Social Support

A measure of social support was used to determine if levels of perceived social support would predict treatment dropout. Specifically, the *Interpersonal Support Evaluation List (ISEL; Cohen, Mermelstein, Kamarck, & Hoberman, 1985)* was used. This 40-item measure was used to assess participants' perception of functional support. Questions are answered on a 4-point scale with regard to 4 types of social support: (1) tangible (i.e., perceived availability of material aide); (2) appraisal (i.e., perceived availability of someone to confide in); (3) self-esteem (i.e., positive comparison when comparing oneself with others); and (4) belonging (i.e., perceived availability of people one can do things with). The ISEL has strong psychometric properties with Chronbach coefficients ranging from .73 to .81 for tangible support, .70 to .82 for appraisal, .62 to .73 for self-esteem, and .73 to .78 for belonging (Cohen et al., 1985; Hietzman & Kaplan, 1988). Reliability of this scale in the current study was acceptable ($\alpha = .74$).

Treatment Readiness

A measure of treatment readiness was used to determine if an individual's stage of change predicts treatment dropout. Specifically, the *Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES; Miller & Tonigan, 1996)* was used. The SOCRATES was originally developed as a parallel measure of the stages of change described by Prochaska and DiClemente (1982). The 19-item SOCRATES loads on three

factors which are conceptualized to represent three continua of readiness to change; *Ambivalence* (about substance use), *Recognition* (of a substance use problem), and *Taking Steps* (to change substance use behavior). Examples of items include "I am a problem drinker" or "I really want to make changes in my substance use." The scale demonstrates good internal consistency with Cronbach alphas of .83 for Taking Steps, .85 for Recognition, and .60 for Ambivalence. Test-retest reliability coefficients ranged from .82 to .94, reflecting excellent test-retest replicability. Reliability of each scale in the current study was acceptable ($\alpha = .90$ for Taking Steps, .85 for Recognition, and .69 for Ambivalence).

Laboratory Challenge Tasks

Each of the laboratory challenge tasks served as a psychological or physical stressor to assess distress tolerance (i.e., persistence on each task). The reader is referred to Study 1 for a description of the PASAT.

Psychological Stressor: The Computerized Mirror-tracing Persistence Task (MTPT-C)

As a computerized version of the Mirror Tracing Persistence Task (MTPT; Quinn, Brandon, & Copeland, 1996), we created the MTPT-C (Strong, Lejuez, Daughters, Marinello, Kahler, & Brown, 2003). For the computerized version of the MTPT (MTPT-C), participants were required to trace a red dot along the lines of a star using the computer's mouse. To make the task similar to the original mirror tracing task, the mouse was programmed to move the red dot in the reverse direction. For example, if the participant moved the mouse to the left then the red dot would move to the right and so on. To increase the difficulty level and frustration, if the participant moved the red dot outside of the lines of the star or if the participant stalled for more than 2 seconds then the

red dot would return to the starting position. The following instructions were read to the participants:

“For this task you will be asked to trace the outline of a star. The further you can trace around the star the more money you can make at the end of the session. To make it difficult, the actions of the computer mouse will be reversed. That is, if you move the mouse down, the red dot will move up on the screen, and if you move the mouse left, the red dot will move to the right. While tracing, if you stop moving forward for more than 2 seconds or move off the line, a buzz will sound and you will need to start over. You can end the task at any time by pressing any key on the computer keyboard. Remember, how well you do on the task affects how much money you make, so you should try your best.”

After receiving instructions the participants began the task and worked independently until the five minute maximum, at which time the task was terminated. The participants were not told the maximum duration prior to beginning the task. Psychological distress tolerance was measured as time in seconds to task termination. Additionally, the number of errors per second (i.e., number of times the participant had to return to the starting position during the task divided by the task time) was recorded to control for the effects of skill level on persistence.

Physical Stressor 1: Breath holding

As maximum breath holding duration has been previously shown to predict duration of cessation attempts in cigarette smokers (Hajek, Belcher, & Stapleton, 1987; Brown et al., 2002), we used breath holding as one physical challenge procedure. Specifically, the experimenter instructed the participants to begin holding their breath for

as long as possible at which time the experimenter began timing with a stop watch. The time was stopped when the participant took a breath. Persistence was measured as latency in seconds to taking a breath. Although Brown et al (2002) utilized both the carbon dioxide inhalation and breath holding tasks as physical stressors and reported that both were equally effective in differentiating immediate and delayed relapsers, the breath holding task was chosen as the physical stressor instead of carbon monoxide inhalation due to safety concerns of being in a psychology department as opposed to a medical setting.

Physical Stressor 2: Cold pressor task (CPT)

The CPT was used as an additional physical challenge procedure (Shumate & Worthington, 1987). As used by Willoughby & Edens (2002), the procedure involves immersion of the nondominant hand and arm to 4" above the wrist in a container of ice water. A 10" x 14" x 10" styrofoam ice chest with a screen partition in the middle was filled with water at a temperature of 33 ± 1 Fahrenheit. The participant was asked to immerse their nondominant hand and forearm in the water up to a specified point marked by the examiner, and told to keep the hand still with their palm face down and fingers pointed toward the bottom of the container. The participant was told to keep their hand in the water for as long as they could and that they could remove it at any time. There was a 5 minute limit on this task at which time the subject was asked to remove their hand. Persistence was measured as latency in seconds to removing the hand from the water.

Data Analysis Plan

First, descriptive statistics and intercorrelations for the self report and distress tolerance measures were calculated using Pearson's *r*. Next, the differences between dropouts and completers across the self report and distress tolerance measures were

examined using Chi-square analyses and *t*-tests, as appropriate. Assuming significant findings for the distress tolerance measures, we planned to test the unique contribution of the distress tolerance measures as predictors of 30 day treatment completion.

Specifically, variables were entered into the logistic regression procedure in two steps (Step 1: demographic variables, legal status, mood measures, levels of psychopathology, and substance use variables; Step 2: psychological distress tolerance).

Chapter 5: Results

Group Status

Individuals were separated into groups based upon whether they completed at least 30 days of treatment. Dropouts were defined as those individuals who either left the facility voluntarily against treatment advice, or were removed due to substance use while in treatment ($n = 18$). Completers were those individuals who completed at least 30 days of treatment ($n = 104$). The mean number of days in the facility for dropouts was 19.5 ($SD = 2.4$). The mean number of days in treatment for completers is unavailable because a large number of individuals were still receiving treatment at the study completion. Although individuals were assigned to either 30, 60, 90, or 180 days of treatment, chi-square analyses indicated that there were no significant differences between dropouts and completers on the number of days they were assigned to treatment [$\chi^2(3) = 0.86, p > .05$].

Relationships among Distress Tolerance Measures

The relationships among the distress tolerance measures are presented in Table 3.

Psychological Distress Tolerance

Overall, individuals persisted on the PASAT for an average of 208.7s ($SD = 165.2$). The mean level of dysphoria at the start of the PASAT was xxxx and at the experimental administration it was xxxxx. Overall, dysphoria increased significantly at the experimental administration of the scale [$t(122) = 5.94, p < .001$], suggesting that the task was psychologically stressful. To control for skill on the PASAT, the number of correct responses during the first two levels were calculated. There was no relationship between number of correct responses and PASAT duration ($p > .05$). With regard to MT, individuals persisted for an average of 197.1s ($SD = 95.9$). To control for skill on the MT,

the number of errors per second (EPS) was calculated by dividing MT time by the number of errors. Independent t-tests revealed a significant relationship between MT time and errors, with individuals with fewer EPS persisting longer on the MT [$t(115) = 1.58, p < .05$], suggesting that individuals who had a more difficult time with the task tended to quit sooner. Correlations were then calculated among the two measures of psychological distress tolerance. As hypothesized, the PASAT and MT were significantly correlated, $r(122) = .38, p < .001$. This correlation remained highly significant after controlling for EPS, $r(108) = .34, p < .001$.

Due to technical difficulties with the computer program, Mirror Tracing (MT) data were missing for the first eleven participants. Using the 111 subjects with scores for both the PASAT and MT, a linear regression was conducted using PASAT to predict MT. Mirror tracing values were then computed for the remaining 11 participants by inserting their PASAT values into the resulting regression equation. A reanalysis using only the 111 participants resulted in no significant differences in the results produced using all of the 122 participants. Thus, analyses for the psychological distress tolerance composite (see below) will include the 11 participants with imputed MT scores. Based on this relationship, these two measures were combined to form a composite psychological distress tolerance score (DT_Psyc), which was created by adding the MT and PASAT z scores.

Physical Distress Tolerance

For medical reasons, two people refused to complete the CP and BH tasks and one person refused to complete the BH task. The overall mean Breath Holding (BH) time was 30.12s ($SD = 13.8$) and the Cold Pressor (CP) time was 99.97s ($SD = 104.6$).

Correlations were calculated among the two measures of physical distress tolerance. As hypothesized, the CP and BH were significantly correlated, $r(122) = .27, p < .01$. As with the psychological distress tolerance measures, the physical distress tolerance measures were combined to form a composite physical distress tolerance score (DT_Phys), which was created by adding the BH and CP z scores.

Relationships among Self Report Measures and Distress Tolerance Measures

The relationships among the self report and distress tolerance measures are also presented in Table 3. With regard to demographics, participants who were younger (Age; $r = -.31, p < .01$) and Male [$t(117) = 6.35, p < .05$] persisted significantly longer on the CP. There were no significant differences with regard to age, gender, ethnicity, education level, marital status, or income on any of the other distress tolerance measures. Regarding the other self report measures, BH duration was negatively correlated with impulsivity ($r = -.20, p < .05$) and MT was negatively correlated with negative affect ($r = -.20, p < .05$), however, each of these correlations were modest in magnitude. Neither PASAT, CP, DT_Psyc, or DT_Phys were significantly related to any of the self report measures.

A number of the self report measures were significantly related to each other. Depressive symptomology (CES-D) was significantly related to positive affect ($r = -.28, p < .01$), negative affect ($r = .59, p < .01$), impulsivity ($r = .29, p < .01$), stress reaction ($r = .61, p < .01$), social support ($r = -.20, p < .05$), and treatment readiness ($r = .28, p < .05$). Positive affect was significantly related to negative affect ($r = -.18, p < .05$), stress reaction ($r = -.19, p < .05$), and social support ($r = .33, p < .01$). Negative affect was significantly related to impulsivity ($r = .22, p < .05$), stress reaction ($r = .49, p < .01$), and smoking severity ($r = .20, p < .05$), and impulsivity was significantly related to stress

reaction ($r = .42, p < .01$) and smoking severity ($r = .24, p < .05$). Social support was significantly related to each stage of change; taking steps ($r = .42, p < .01$), treatment readiness ($r = .20, p < .05$), and treatment ambivalence ($r = .33, p < .01$), and each of the stages of change subscales were positively and significantly related to each other (p 's $< .01$).

Mean Differences between Dropouts and Completers

Demographics

Table 4 presents differences between dropouts and completers with regard to age, gender, ethnicity, marital status, education, total household income, and employment. Participants indicated their total household income on an 11 point Likert scale ranging from 0 to 10, with 0 representing '\$0-\$9,999', 1 representing '\$10,000-\$19,999', up to 10 representing '\$100,000 or more'. Due to the high overall rate of African Americans in the sample (95.1%), ethnicity was categorized as African American or other ethnicity. Other ethnicity included 4 Caucasians, 1 Asian, and 1 other. For marital status, individuals were categorized as either single or not single. Individuals categorized as not single indicated that they were either married, separated, or living with a partner as if married. There were no significant differences between dropouts and completers on any demographic variables. It is of note that age approached significance, with younger individuals being more likely to dropout within 30 days ($p = .06$).

Diagnostic Status

The presence of Axis I disorders as well as Borderline Personality Disorder (BPD) and Antisocial Personality Disorder (ASPD) are presented in Table 6. To ensure adequate power to detect an effect, only disorders for which at least 10% of the entire

sample met diagnostic criteria are included. Dropouts were significantly more likely than completers to meet criteria for Alcohol Dependence ($\chi^2(2) < .05$), while there were no significant group differences in rates of Major Depressive Disorder (MDD), Past Major Depressive Disorder (Past MDD), BPD, ASPD, or Substance Dependence other than alcohol. Comorbidity was assessed to determine if the presence of both Substance Dependence and an additional Axis-I disorder was related to dropping out of treatment. Although only disorders for which at least 10% of the sample met criteria were analyzed for group differences, all disorders were included when assessing differences in comorbidity. Rates of comorbidity did not differentiate dropouts and completers.

Self Report Measures

Mean differences between dropouts and completers on the self-report measures are presented in Table 5. There were no group differences on depressive symptoms, negative or positive affect, impulsivity, stress reaction, social support, stage of change, or amount of weekly substance use. There were significant differences with regard to smoking severity, with dropouts reporting significantly higher levels of smoking than completers ($p = .05$).

Distress Tolerance Measures

Group differences on the distress tolerance measures are presented in Figures 1-3. There were no significant differences in persistence between dropouts and completers on the BH, CP, or the Physical Distress Tolerance composite, whereas dropouts were significantly less persistent than completers on the PASAT ($p < .01$), MT ($p < .01$), and the Psychological Distress Tolerance composite ($p < .001$).

Predictors of Treatment Dropout

The results of a multivariate logistic regression to predict treatment dropout can be seen in Table 7. Demographic variables, legal status, substance use severity, affective states, and comorbidity were entered first. Although significant differences were not evidenced across dropouts and completers on the majority of these measures, they were included in this first step given that they have been theorized to predict treatment dropout and therefore would be useful to control for when examining the relationship between psychological distress tolerance and treatment dropout. As such, psychological distress tolerance was entered second to determine its unique contribution to treatment dropout. All variables were z scored to facilitate interpretation. Overall, the first step of the model was significant, $\chi^2(9) = 16.96, p < .05$. Within this initial model, age (Wald = 7.72, $p < .01$; OR = 0.401; 95% CI = .210 - .764) and Alcohol Dependence (Wald = 6.24, $p < .05$; OR = 2.23; 95% CI = 1.19 – 4.175) were significant predictors of dropout. Upon entering psychological distress tolerance in a second step, the final model remained significant, $\chi^2(10) = 32.26, p < .001$. Within the complete model, Age (Wald = 8.80, $p < .01$; OR = 0.33; 95% CI = 0.156-0.684), Alcohol Dependence (Wald = 5.64, $p < .05$; OR = 2.49; 95% CI = 1.17 – 5.26), and psychological distress tolerance (Wald = 11.08, $p < .001$; OR = 3.80; 95% CI = 1.73 – 8.34) all were related to treatment dropout.

Table 2. Percentage of the current sample acknowledging any use or weekly use among each drug type in the past year

Drug Class	Acknowledging Any Use	Acknowledging Weekly Use
Alcohol	77.9 %	41.0%
Marijuana	65.6 %	27.0%
Ecstasy	13.1 %	0.8%
Stimulants (other than cocaine)	09.8 %	5.0%
Crack/Cocaine	79.5 %	60.7%
Opiates	35.2 %	27.9%
Hallucinogens (other than PCP)	23.8 %	5.0%
PCP	41.0 %	18%
Sedatives	11.5 %	4.1%
Inhalants	05.7%	0.0%

Table 3. Means, standard deviations, internal consistencies (α), and intercorrelations among distress tolerance and self report measures

	<i>M</i> (SD)	α	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. PASAT	208.71(165.22)	---	---	.38**	.04	.11	N/A	.09	.13	-.04	.04	.05	.15	.03	.09	.09	.13	-.04	-.09
2. MT	197.07 (95.88)	---		---	.04	-.02	N/A	.01	-.07	.13	-.20*	.05	.03	-.04	.12	-.06	.15	.03	.03
3. BH	30.12 (13.77)	---			---	.27**	.05	N/A	-.03	.02	-.03	-.20*	.08	.00	.03	.10	.02	.05	-.01
4. CP	99.97 (104.59)	---				---	.06	N/A	-.07	-.01	.01	-.03	-.03	-.02	-.13	-.05	-.03	.01	-.02
5. DT_Psy	N/A	---					---	.06	.03	.05	-.10	.06	.11	.00	.12	.02	.17	-.01	-.04
6. DT_Phy	N/A	---						---	-.06	.01	-.02	-.15	.02	-.02	-.06	.03	-.01	.04	-.02
7. CES-D	22.69 (11.53)	.76							---	-.28**	.59**	.29**	.61**	-.20*	.05	.28*	.03	.05	.10
8. PA	3.46 (0.92)	.89								---	-.18*	-.12	-.19*	.33**	.13	-.05	.03	.01	-.17
9. NA	1.85 (0.81)	.88									---	.22*	.49**	-.11	-.07	.17	.03	.20*	.13
10. Imp	9.70 (4.66)	.76										---	.42**	-.02	.02	.12	.09	.24**	.11
11. MPQ_SR	6.10 (4.20)	.84											---	-.11	-.06	.17	.02	.15	.08
12. ISEL_Tot	111.63 (11.63)	.74												---	.49**	.20*	.33**	-.11	-.11
13. SOC_Ts	22.59 (3.84)	.90													---	.76**	.59**	-.06	.03
14. SOC_Re	30.80 (5.35)	.85														---	.47**	.05	.17
15. SOC_Am	26.61 (5.44)	.69															---	-.05	-.14
16. FTND	5.06 (2.64)	.60																---	.10
17. WDU	12.27 (6.12)	---																	---

Table 4. Means and standard deviations of demographic variables among the entire sample as well as group differences between dropouts and completers.

	Overall Sample	Dropouts	Completers	Statistic
Age	40.3 (8.9)	36.7 (8.2)	41.0 (9.0)	$t(120) = 1.88, p = .06$
Total Household Income	\$18,100 (24,500)	\$22,200 (22,400)	\$17,400 (25,200)	$t(120) = -0.97, p = .34$
Gender (% Male)	70.5%	77.8%	69.2%	$\chi^2(1) = .46$
Ethnicity (% African American)	95.1%	94.4%	95.2%	$\chi^2(1) = .89$
Marital/Relationship Status (% Single)	72.1%	72.2%	72.1%	$\chi^2(1) = .99$
Employment Status (% Unemployed)	79.5%	66.7%	81.7%	$\chi^2(1) = .14$
Education Level				$\chi^2(2) = .53$
Some High School	27.0%	22.2%	27.9%	
High School Graduate/GED	43.4%	55.5%	41.3%	
Some College/Technical School/College Graduate	29.5%	22.2%	30.8%	

Table 5. Group differences on self report measures.

Measure	Dropouts		Completers		<i>t</i> -test
	Mean	SD	Mean	SD	
Depressive Symptoms (CES-D)	23.44	12.32	22.56	11.44	$t(120) = -.30, p = .77$
Affect (PANAS)					
Positive	3.62	0.90	3.43	0.92	$t(119) = -0.83, p = .41$
Negative	1.91	0.90	1.84	0.80	$t(119) = -0.30, p = .76$
Impulsivity (I-7)	9.53	4.78	9.73	4.66	$t(115) = 0.16, p = .87$
Stress Reaction (MPQ_SR)	7.22	4.86	5.90	4.07	$t(120) = -1.23, p = .22$
Social Support (ISEL)	111.61	10.86	111.63	11.80	$t(120) = 0.01, p = .99$
Stages of Change (SOCRATES)					
Taking Steps	21.83	4.57	22.72	3.71	$t(120) = 0.91, p = .37$
Readiness	30.11	5.69	30.92	5.31	$t(120) = 0.59, p = .55$
Ambivalence	25.17	5.12	26.86	5.48	$t(120) = 1.22, p = .23$
Smoking (FTND)	3.50	1.69	2.94	1.78	$t(120) = -1.96, p = .05^*$
Weekly Substance Use (WDU)	13.50	6.73	12.06	6.01	$t(120) = 0-.92, p = .36$

Table 6. Percentage of sample meeting diagnostic criteria for DSM-IV Axis I disorders and Antisocial and Borderline Personality Disorder

Diagnosis	Overall	Dropouts	Completers	χ^2
MDD	18.5%	16.7%	18.3%	.92
Past MDD	15.6%	16.7%	15.4%	.84
BPD	9.8%	0.0%	11.5%	.14
APD	18.9%	27.8%	17.3%	.26
Substance Dependence				
Alcohol	31.9%	44.4%	21.2%	.03*
Cannabis	26.2%	16.7%	12.5%	.58
Opiates	30.3%	27.8%	28.8%	1.00
Cocaine	67.2%	55.6%	56.7%	.94
Hallucinogens	13.9%	11.1%	8.7%	.70
Polysubstance	38.7%	38.9%	37.5%	.82
Comorbidity*	34.4%	38.9%	33.7%	.58

* Participants meeting criteria for an additional Axis -I disorder other than substance dependence

** Only includes disorders for which at least 10% of sample met criteria

Figure 1. Mean differences in persistence (seconds) between dropouts and completers on the PASAT and Mirror Tracing tasks.

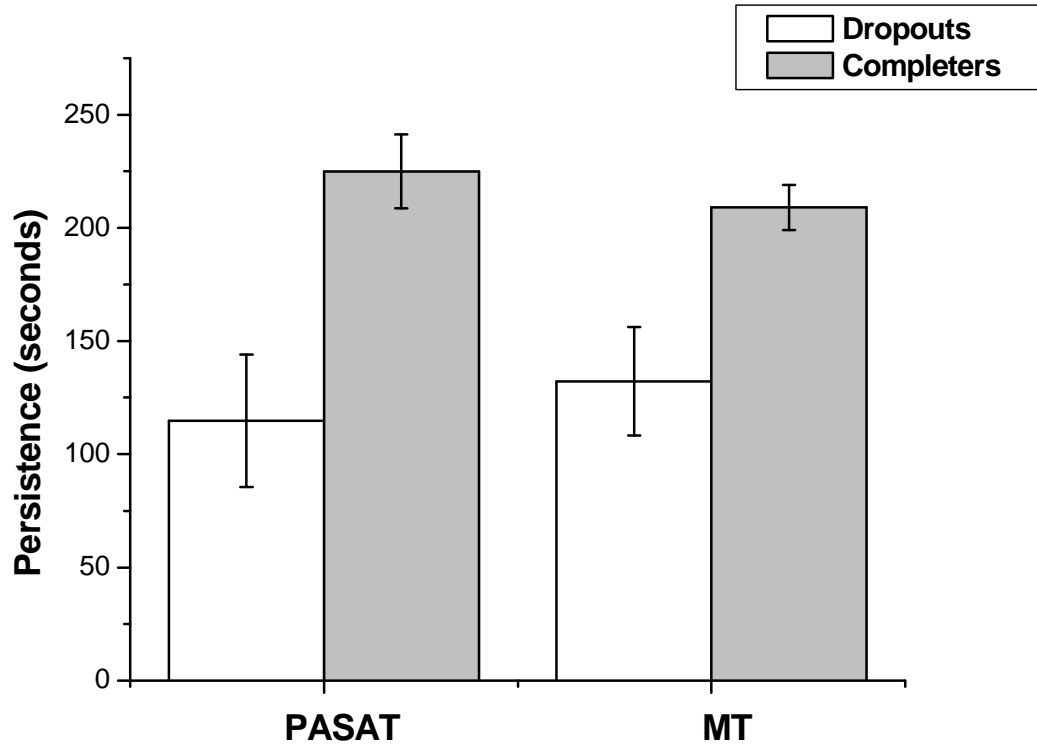


Figure 2. Mean differences in persistence (seconds) between dropouts and completers on the Breath Holding and Cold Pressor tasks.

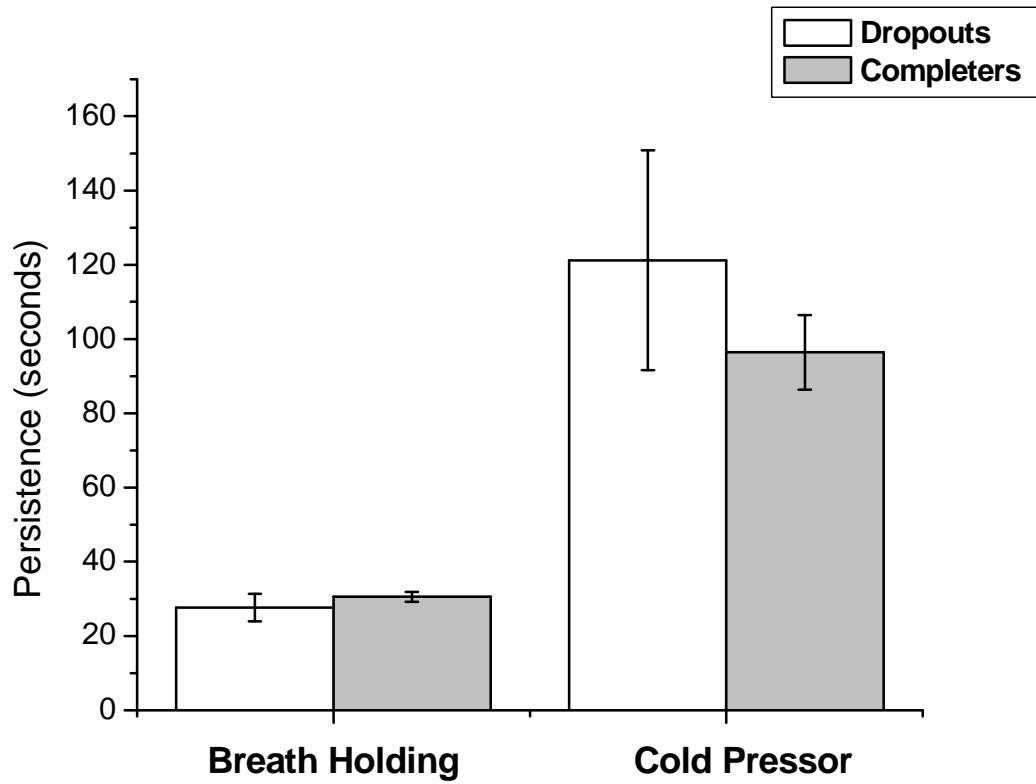


Figure 3. Mean differences in persistence (seconds) between dropouts and completers on the psychological and physical distress tolerance composite scores.

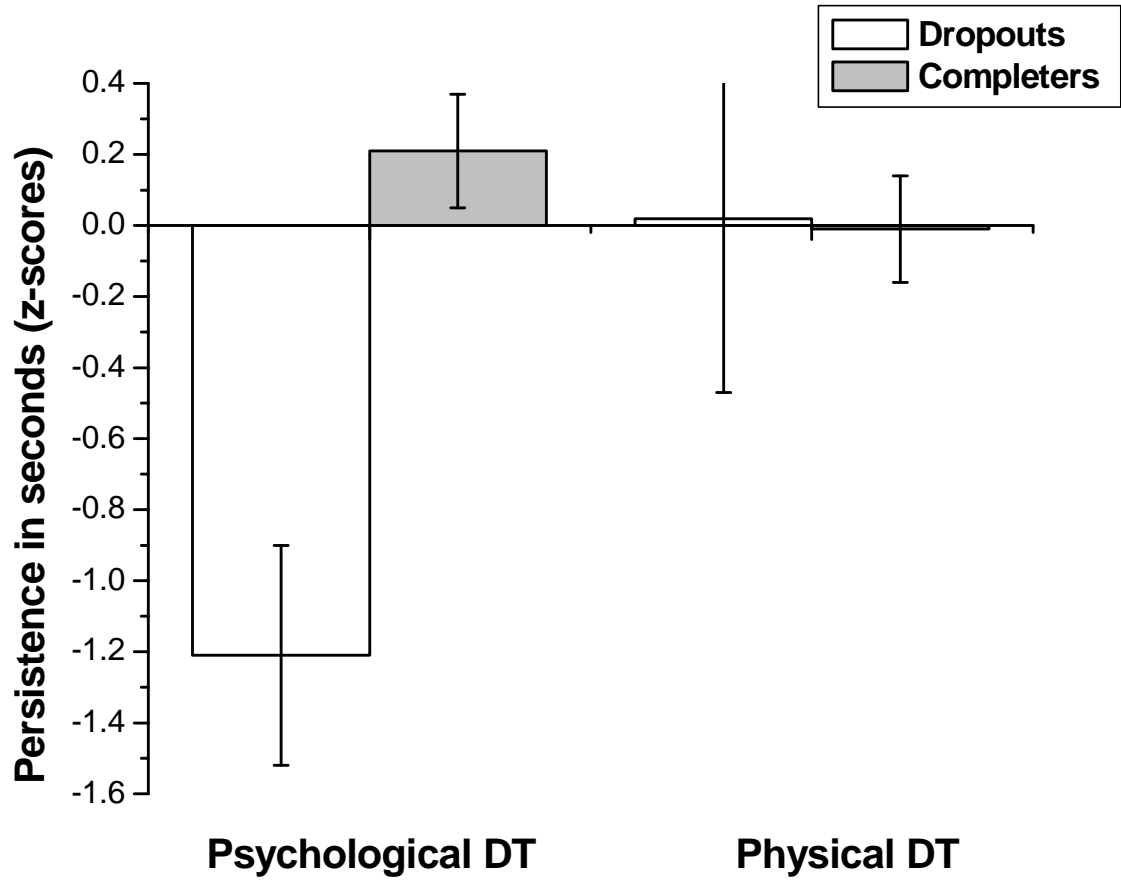


Table 7. Logistic regression analysis with covariates of demographic variables, legal status, comorbidity, substance use, negative affective states, and psychological distress tolerance

Predictor	B	SE (B)	Wald χ^2	Odds Ratio	95% CI
Initial Model			16.96*		
Age	-.914	.329	7.718**	.401	.210 - .764
Gender	-.015	.312	.002	.986	.534 – 1.818
Legal Status	-.232	.284	.668	.793	.454 – 1.383
Substance Use Severity	-.127	.303	.177	.880	.486 – 1.594
Alcohol Dependence	.801	.321	6.241*	2.227	1.188 – 4.175
Smoking Severity (FTND)	.563	.365	2.379	1.756	.858 – 3.594
Depressive Symptoms (CES-D)	-.070	.409	.030	.932	.418 – 2.077
Negative Affect (PANAS)	-.060	.378	.026	.941	.449 – 1.974
Comorbidity	.270	.338	.641	1.311	.676 – 2.541
Final Model			32.26***		
Age	-1.120	.378	8.801**	.326	.156 - .684
Gender	.253	.364	.483	1.288	.631 – 2.631
Legal Status	-.276	.322	.736	.758	.403 – 1.427
Substance Use Severity	-.140	.341	.168	.870	.445 – 1.698
Alcohol Dependence	.909	.383	5.638*	2.483	1.172 – 5.259
Smoking Severity (FTND)	.704	.396	3.164	2.022	.931 – 4.392
Depressive Symptoms (CES-D)	.275	.456	.365	1.317	.539 – 3.218
Negative Affect (PANAS)	-.427	.396	1.165	.652	.300 – 1.417
Comorbidity	.235	.397	.351	1.265	.581 – 2.751
Psychological Distress Tolerance	1.335	.401	11.078***	3.801	1.731 – 8.344

Note: CI = Confidence Intervals; * $p < .05$, ** $p < .01$, *** $p < .001$.

Entry of distress tolerance alone in Step 2 was significant, $\chi^2(1,10) = 15.31$, $p < .001$

Chapter 5: Discussion

In the current study, individuals in their first week of residential treatment for substance abuse were exposed to challenge tasks intended to produce the type of psychological and physical distress that might occur in the context of the early stages of treatment. As such, it was hypothesized that individuals who dropped out of treatment within 30 days (dropouts) would evidence lower levels of both psychological and physical distress tolerance (persistence) on the stressor tasks than individuals who were able to complete at least 30 days of treatment (completers). As predicted, dropouts were significantly less likely to persist on the psychological stressors than completers, above and beyond characteristics previously reported to predict treatment dropout. Conversely, there were no differences in persistence between dropouts and completers on the physical stressors. These findings in drug abusers are in line with previous work with smokers and gamblers reporting that persistence on a psychological stressor is significantly related to abstinence duration (Brandon et al., 2003; Brown et al., 2002, Daughters et al., 2004), suggesting that similar processes are occurring across addictions with regard to the relationship between psychological distress tolerance and successful abstinence.

Although previous work reported that breath holding duration (and an additional physical distress tolerance measure not used in the current study) predicted smoking cessation duration (Brown et al., 2002), the physical distress tolerance composite was not related to treatment dropout in the current study. There could be a number of reasons for this finding. First, before entering treatment at the Salvation Army Harbor Light facility, individuals are required to enter detoxification or to be

abstinent for a minimum of three days. As many individuals are unable to complete detoxification, and thus do not enter treatment, the current sample may include select individuals who are able to persist through physical withdrawal symptoms enough to complete detoxification and enter the Harbor Light Treatment Center. Consequently, future studies examining physical distress tolerance prior to detoxification are needed before this construct can be ruled out as a potential predictor of treatment dropout.

Interestingly, although previous studies have indicated that level of distress tolerance is significantly related to depressive symptoms (Daughters et al., 2004), negative affect (Brown et al., 2002; Personal Communication Richard Brown), and stress reaction (Daughters et al., 2004) there wasn't a clear relationship between the distress tolerance measures and self report variables in the current study. Although negative affect was related to mirror tracing persistence, such that individuals persisting longer on the mirror tracing task had lower levels of negative affect, there was no relationship between negative affect and PASAT persistence. Furthermore, self reported levels of stress reaction, a variable thought to capture similar process present in distress tolerance, similarly was not related to any of the distress tolerance tasks. One plausible explanation for this may be that the overall higher levels of negative affect, depressive symptoms, and stress reaction specific to this sample of inner city drug abusers precluded any differences. Thus, although the exact relationship between distress tolerance and other self report constructs remains unclear, needing further study over time, the fact that it is consistently predictive of behavior suggests that it is getting at a core feature of one's ability to persist in treatment.

In attempting to understand the processes present in an abstinence attempt, Brown et al. (2002) argue that individuals who relapse back to smoking within the early stages of an abstinence attempt suffer from increased negative affect and urge to smoke in response to nicotine deprivation combined with a tendency to lack behavioral persistence in the face of physical and emotional discomfort. Although levels of negative affect play a role in abstinence, this may not be the key variable, such that it is those individuals who are able to persist despite increased levels of negative affect that are most likely to complete treatment. Yet, the mechanisms responsible for increased persistence are still unclear. In an attempt to apply theory to understanding why persistence in the face of negative affect and distress predicts abstinence duration in addictive disorders, Quinn et al (1996) and Brandon et al (2003) proposed that the relationship between distress tolerance and treatment completion can be explained through the concept of learned industriousness (Eisenberger, 1992). In brief, learned industriousness theory states that the amount of effort an individual displays is dependent on the degree of aversiveness associated with the effort evoked on the specific task, and this level of aversiveness is a function of prior learning history. Specifically, a history of reinforcement for low effort will likely lead to high effort being aversive, and a history of reinforcement for high effort would lead to experiencing high effort as rewarding. Thus, the reinforcement for high effort should generalize across behaviors, leading to a greater probability of high effort in the future, and vice versa.

Although our results may first appear to provide some support for learned industriousness theory because of the similar findings across studies with regard to

abstinence duration and psychological distress (Brandon et al., 2003; Brown et al., 2002; Daughters et al., in press; Quinn et al., 1996), neither the current study nor any previous study in this area have directly tested the basic tenants of the theory (i.e., learning history, generalization of effort). That is, has past learning history led certain individuals to believe that persisting in the face of distress will lead to positive outcomes? Furthermore, individuals did not perform similarly on all of the distress tolerance tasks in the current study. Namely, there were differences in performance between psychological and physical tasks, demonstrating that reinforcement for high effort (persistence) does not necessarily generalize across behaviors. While it could be argued that a history of reinforcement for high effort only generalizes within psychological or physical domains, and not across domains, in the Brandon et al. (2003) study individuals did not perform similarly on each of the psychological distress tolerance tasks. Thus, although the attempt to integrate theory is useful, it must first be tested at the roots of the assumptions to be of value in the current context.

In addition to examining levels of psychological and physical distress tolerance, additional variables that have previously demonstrated a relationship with substance abuse treatment dropout were considered. One such variable was substance use severity. Quinn et al. (1996) and Brandon et al. (2003) found smoking severity to be significantly related to early lapse among smokers. Additionally, previous work has implicated substance use severity in substance abuse treatment dropout (Kleinman et al., 1992; Stark, 1992). Thus, individuals with more severe levels of substance dependence may have experienced greater difficulty with both the

challenge tasks and remaining in treatment due to the long-term effects of more severe substance abuse (e.g., neurological, psychological; Saunders & Brady, 2002). However, in the current study past year substance use severity was not related to treatment dropout. This could have been due to the high level of substance use in the sample, as more than 90% of the sample reported using at least one substance four to five times per week. In future studies it may be useful to assess frequency of substance use more specifically, including number of times per day, in order to increase the variability in substance use severity.

Although substance use severity did not differentiate dropouts from completers, individuals meeting diagnostic criteria for alcohol dependence, as well as those with higher smoking severity, were significantly more likely to dropout of treatment. These findings suggest that an increased number of addictions may increase one's likelihood of dropping out of treatment. While this may be a function of substance use severity, it may also be a function of the number of goals one is trying to achieve. For example, Stotts, Schmitz, and Grabowski (2003) assessed 115 alcohol and tobacco dependent outpatients entering a dual-substance dependence program on baseline measures of motivation, self-initiated change activities, and self-efficacy associated with each substance use behavior. An interaction between drinking and smoking motivation for change was found in the prediction of treatment retention, such that those with higher motivation for changing their alcohol use and lower motivation to quit smoking remained longer in treatment, while those who were higher in motivation for changing both behaviors dropped out the earliest.

One theory that may explain this phenomenon is goal systems theory (Kruglanski, Shah, & Fishbach, 2002). In this theory it is proposed that different goals may be activated at the same time through environmental priming and as a result may compete with each other for mental resources. Consequently, the presence of alternative goals serves to undermine the commitment to the primary goal. In a representative study, Shah & Kruglanski (2003) informed participants that they were going to work on two consecutive tasks, the first of which was an anagram solution. While working on the anagram task (considered the primary goal), participants were subliminally primed with either the second task that they were expected to perform (alternative goal) or a control phrase. Commitment to the primary goal was assessed through persistence on the first task, performance success, and affective reactivity to success and failure feedback. Each measure of commitment showed significant decline in the group that was primed with the alternative goal as compared to the control phrase, suggesting that an increase in goals may decrease one's resources for completing their primary goal.

Implications of this finding for treatment are potentially significant. Treatment approaches in many residential substance abuse treatment facilities focus on relapse prevention techniques, where substance abusers are encouraged to generate alternative behaviors to begin to create a healthy and substance free lifestyle. Specifically, they are challenged to come up with a number of other activities that will provide them with the positive reinforcement that substance use provides, which can be quite a challenging task for individuals who have used substances on a daily basis for most of their lives. Moreover, if they also are attempting to quit smoking

and using alcohol, this will increase the number of alternative activities and lifestyle changes that they will have to make, thus making treatment all the more challenging. Given the current findings and evidence from goal systems theory, it may be useful for treatment providers to work with individuals attempting to quit more than one addiction in a step by step manner, focusing on one addiction at a time so as to decrease the overwhelming nature of treatment, thereby increasing their levels of confidence in completing treatment. However, it should be noted that this theory-driven perspective is counter to traditional beliefs regarding the need to remove alcohol as well as concerns over the disinhibitory effects of alcohol making drug use more likely while in recovery. Clearly, these findings raise important points that need specific empirical attention.

In addition to substance use severity, negative affect and levels of psychopathology have been suggested to be related to substance abuse treatment dropout (Hattenschwiler, Ruesch, & Modestin, 2001; Lang & Belenko, 2000). However, neither baseline levels of negative affect, depressive symptoms, nor stress reaction were related to treatment dropout in the current study. Furthermore, individuals meeting criteria for an additional Axis-I disorder aside from substance dependence were no more likely to dropout of treatment. This is in contrast to studies reporting that that levels of negative affect are related to smoking cessation duration (Brown et al., 2002; Brandon et al., 2003), and that negative affect, depression, and comorbidity are related to substance abuse treatment dropout. However, it is of note that in the current sample, 65% of the residents indicated clinically meaningful levels of depressive symptoms (Radloff, 1977). This high rate of depressive symptoms may

have precluded the detection of any group differences. On the other hand, it is interesting to note that in the Bell et al (1996) study, although pretreatment levels of depression and anxiety were significantly related to treatment dropout, individuals who exhibited decreases in their depressive symptoms in the first two weeks of treatment were significantly more likely to stay in treatment, while those who did not demonstrate improvements were more likely to dropout. As such, a more accurate indicator of the relationship between negative affective states and treatment dropout may be the degree of improvement of these symptoms in the early stages of treatment, and thus should be examined in future research.

Finally, demographic variables, namely age and gender, have been implicated in substance abuse treatment dropout. In the current study only age was significantly related to treatment dropout, with younger individuals being significantly less likely to complete treatment. It has been argued that younger individuals are more impulsive and likely to have fewer family and/or community ties that would serve to increase support for treatment and decrease geographic mobility (Stark, 1992). Furthermore, it makes conceptual sense such that older individuals who have lived with the negative consequences of substance abuse and treatment failure would approach treatment with more dedication. There were no differences with regard to gender, ethnicity, education level, or socioeconomic status. However, it is of note that there was a lack of variability among participants with regard to ethnicity, education level, and SES, with the majority of individuals being African American, having a high school education, and falling in a low socioeconomic bracket, which may have precluded any differences in treatment completion. Finally, levels of social support and

treatment readiness have both been argued to predict treatment dropout. However, neither perceived levels of social support or readiness for treatment were related to treatment completion.

Limitations, Implications, and Future Directions

Several limitations are of note. First, although there are a number of advantages inherent in self-report measures, they are accompanied by a number of limitations (e.g., Leigh & Stall, 1993), many of which may have been especially pronounced in this sample. Both the effects of chronic substance use and the low level of education among the sample may have led to a lack of insight or cognitive ability to understand questions or provide an accurate report of their own behavior. Furthermore, it is unclear if many of the self-report measures are culturally sensitive, and may have been inappropriately applied to the thoughts, feelings, and behaviors of inner city African Americans (Hutchison, 1996). Despite these potential barriers, the self report measures demonstrated moderate to high internal consistencies and were also correlated highly with each other, suggesting that the self report constructs may have been adequately assessed. Thus, the utility of the behavioral tasks in this sample is extremely promising. Second, the sample included a mix of court referred and non court referred individuals. While this variable was not predictive of dropout, given the findings that court referred individuals are more likely to stay in treatment to avoid legal circumstances (Maglione, Chao, & Anglin, 2000), the completers may have included a number of individuals who may have otherwise left treatment. Furthermore, there was a lack of variability in the sample with regard to race. Although this is an important and underrepresented population, future studies should

attempt to measure these constructs in more heterogeneous samples. Finally, although the findings suggest that psychological distress tolerance predicts treatment dropout, it is still unclear if distress tolerance is related to continued substance use following treatment. Thus, future studies should incorporate long term follow-ups addressing this question.

Despite the early stages of this line of research, the current results have several potential implications. First, this study highlights the importance of the use of behavioral tasks to allow researchers to collect more precise, time- and context-specific results. Furthermore, although previous studies have found a significant relationship between distress tolerance and length of abstinence, this study is the first to use two behavioral measures for each distress tolerance construct (psychological, physical). As predicted, the specific measures of each distress tolerance construct were highly correlated with one another, providing additional evidence for the construct validity of physical and psychological distress tolerance. Furthermore, the finding that psychological distress tolerance predicts treatment dropout suggests that the PASAT and MT are potentially promising instruments for examining an individuals' level of psychological distress tolerance and likelihood of completing treatment upon entrance to residential treatment. As such, individuals with low levels of psychological distress tolerance can be targeted to receive treatment modules addressing this deficit, such as those emphasizing effective coping skills, such as task oriented coping strategies rather than avoidance and other emotion-focused coping strategies (Lightsey & Hulsey, 2002). As treatment progresses, changes in distress tolerance can be measured by exposing individuals to psychologically distressing

situations and measuring their persistence and use of effective coping skills. Finally, although predicting treatment dropout is an important and preliminary step in this line of research, many individuals do complete treatment and then go on to relapse soon after. Therefore, it will be important to assess the long term predictability of this construct by including long term follow-ups in the study design. Given that it is unclear at this time how levels of distress tolerance fluctuate, it will also be important to assess how changes in distress tolerance relate to treatment completion and long term abstinence. Specifically, future studies assessing substance use as well as distress tolerance prior to treatment, during treatment, at treatment completion, and at post treatment follow-ups will provide important data describing the relationship between current levels of distress tolerance and substance use.

Bibliography

Arfkin, C.L., Klein, C., di Menza, S., & Schuster, C.R. (2001). Gender differences in problem severity at assessment and treatment retention. *Journal of Substance Abuse Treatment, 20*, 53-57.

Armenian, S.H., Chutuape, M.A., & Stitzer, M.L. (1999). Predictors of discharges against medical advice from a short-term hospital detoxification unit. *Drug and Alcohol Dependence, 56(1)*, 1-8.

Babor, T. F., & Del Boca, F. K. (1992). Just the facts: Enhancing measurement of alcohol consumption using self-report methods. In Allen, J. P. (Ed.) *Measuring alcohol consumption: Psychosocial and biochemical methods*, pp. 3-19.

Baekeland, F., & Lundwall, L. (1975). Dropping out of treatment: A critical review. *Psychological Bulletin 82(5)*, 738-783.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*, 191-215.

Beck, J. G., Shipherd, J.C., & Zebb, B. J. (1996). Fearful responding to repeated CO₂ inhalation: A preliminary investigation. *Behavior Research and Therapy, 34*, 609-620.

Bell, D.C., Atkinson, J.S., Williams, M.L., Nelson, R., & Spence, R.T. (1996). Trajectory of client progress: A longitudinal pilot study. *Journal of Substance Abuse Treatment, 13(3)*, 211-218.

Blanchard, K.A., Morgenstern, J., Morgan, T.J., Labouvie, E., & Bux, D.A. (2003). Motivational subtypes and continuous measures of readiness for change: Concurrent and predictive validity. *Psychology of Addictive Behaviors, 17(1)*, 56-65.

Brandon, T.H., Herzog, T.A., Juliano, L.M., Irvin, J.E., Lazev, A.B., & Simmons, V.N. (2003). Pretreatment task-persistence predicts smoking cessation outcome. *Journal of Abnormal Psychology, 112*(3), 448-456.

Brewer, L.G., Zawadski, M.L., & Lincoln, R. (1990). Characteristics of alcoholics and codependents who did and did not complete treatment. *International Journal of the Addictions, 25*(6), 653-663.

Brown, M.Z., Comtois, K.A., & Linehan, M.M. (2002). Reasons for suicide attempts and nonsuicidal self-injury in women with borderline personality disorder. *Journal of Abnormal Psychology, 111*(1), 198-202.

Brown, B.S., Joe, G.W., & Thompson, P. Minority group status and treatment retention. *International Journal of the Addictions, 20*(2), 319-335.

Brown, R. A., Lejuez, C. W., Kahler, C. W., & Strong, D. (2002). Distress tolerance and duration of past smoking cessation attempts. *Journal of Abnormal Psychology.*

Brown, R.A., Monti, P.M., Myers, M.G., Martin, R.A., Rivinus, T., Dubreuil, M.E., & Rohsenow, D.J. (1998). Depression among cocaine abusers in treatment: Relation to cocaine and alcohol use and treatment outcome. *American Journal of Psychiatry, 155*(2), 220-225.

Campbell, D.T., & Fiske, D. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin, 56*, 81-105.

Carmichael, J.S., Linn, M.W., & Pratt, T. (1977). Self-concept and substance abuse treatment. *Comprehensive Psychiatry, 18*(4), 357-362.

- Carroll, K., Ziedonis, D., O'Malley, S.S., & McCance-Katz, E. (1993). Pharmacologic interventions for alcohol- and cocaine-abusing individuals: A pilot study of disulfiram vs. naltrexone. *American Journal on Addictions, 2(1)*, 77-79.
- Chou, C., Hser, Y., & Anglin, M.D. (1998). Interaction effects of client and treatment program characteristics on retention: An exploratory analysis using hierarchical linear models. *Substance Use & Misuse, 33(11)*, 2281-2301.
- Clark, L.A., & Watson, D. (1988). Mood and the mundane: Relations between daily life events and self-reported mood. *Journal of Personality & Social Psychology, 54(2)*, 296-308.
- Claus, R.E., Kindleberger, L.R., & Dugan, M.C. (2002). Predictors of attrition in a longitudinal study of substance abusers. *Journal of Psychoactive Drugs, 34(1)*, 69-74.
- Cohen, S., Mermelstein, R., Kamarck, T., & Hoberman, H. (1985). Measuring the functional components of social support. In Sarason, I. and Sarason, B. (Eds.) 1985. *Social support: Theory, research, and applications*. Martinus Nijhoff, Dordrecht: Netherlands, pp. 73-94.
- Coletti, S.D., Schinka, J.A., Hughes, P.H., & Hamilton, N.L. (1995). PAR Village for chemically dependent women: Philosophy and program elements. *Journal of Substance Abuse Treatment, 12(4)*, 289-296.
- Collins, J.J., & Allison, M. (1983). Legal coercion and retention in drug abuse treatment. *Hospital & Community Psychiatry, 34(12)*, 1145-1149.

Conway, K.P., Kane, R.J., & Ball, S.A. (2003). Personality, substance of choice, and polysubstance involvement among substance dependent patients. *Drug & Alcohol Dependence*, 71(1), 65-75.

Craddock, S. G., Rounds-Bryant, J.L., Flynn, P.M., & Hubbard, R.L. (1997). Characteristics and pretreatment behaviors of clients entering drug abuse treatment: 1969 to 1993. *American Journal of Drug & Alcohol Abuse*, 23(1), 43-59.

Crits-Christoph, P., & Siqueland, L. (1996). Psychosocial treatment for drug abuse: selected review and recommendations for national health care. *Archives of General Psychiatry*, Vol 53(8), 749-756.

Daughters, S.B., Lejuez, C.W., Kahler, C., Strong, D., & Brown, R. (in press). Psychological distress tolerance and duration of most recent abstinence attempt among residential treatment seeking substance abusers. *Psychology of Addictive Behaviors*.

Daughters, S.B., Lejuez, C.W., Strong, D., Breen, R., & Lesieur, H.R. (2004). The relationship among negative affect, distress tolerance, and latency to gambling treatment failure. Manuscript submitted for publication.

Deary, I. J., Ebmeier, K. P., MacLeod, K. M., Dougall, N., Hepburn, D. A., Frier, B. M. et al. (1994). PASAT performance and the pattern of uptake of –super (99m)Tc-exametazime in brain estimated with single photon emission tomography. *Biological Psychology*, 38, 1-18.

De Leon, G., Hawke, J., Jainchill, N., & Melnick, G. (2000). Therapeutic communities. Enhancing retention in treatment using "senior professor" staff. *Journal of Substance Abuse Treatment*, Vol 19(4), 375-382.

De Leon, G., & Jainchill, N. (1986). Circumstance, motivation, readiness, and suitability as correlates of treatment tenure. *Journal of Psychoactive Drugs*, 18, 203-208.

De Leon, G., Melnick, G., & Schoket, D. (1993). Is the therapeutic community culturally relevant? Findings on race/ethnic differences in retention in treatment. *Journal of Psychoactive Drugs*, 25(1), 77-86.

DiClemente, C.C., & Prochaska, J.O. (1998). Toward a comprehensive, transtheoretical model of change: Stages of change and addictive behaviors. In W.R. Miller and N. Heather (Eds.). *Treating addictive behaviors (2nd Edition)*. Applied Clinical Psychology; 3 – 24.

Diehr, M. C., Heaton, R. K., Miller, W., & Grant, I. (1998). The paced auditory serial addition task (PASAT): Norms for age, education, and ethnicity. *Assessment*, 5, 375-387.

Dobkin, P.L., De Civita, M., Paraherakis, A., & Gill, K. (2002). The role of functional social support in treatment retention and outcomes among outpatient adult substance abusers. *Addiction*, 97, 347-356.

Doherty, K., Kinnunen, T., Militello, F.S., & Garvey, A. (1995). Urges to smoke during the first month of abstinence: Relationship to relapse and predictors. *Psychopharmacology*, 119(2), 171-178.

Eisenberger, R. (1992). Learned industriousness. *Psychological Review*, 99(2), 248-267.

Elman, I., Breiter, H.C., Gollub, R.L., Krause, S., Kantor, H.L., Baumgartner, W.A.,

Gastfriend, D.R., & Rosen, B.R. (1999). Depressive symptomatology and cocaine-induced pituitary-adrenal axis activation in individuals with cocaine dependence. *Drug & Alcohol Dependence*, 56(1), 39-45.

Eysenck, S.B., Pearson, P.R., Easting, G., & Allsopp, J.F. (1985). Age norms for impulsiveness, venturesomeness and empathy in adults. *Personality & Individual Differences*, 6(5), 613-619.

Fals-Stewart, W. (1992). Personality characteristics of substance abusers: An MCMI cluster typology of recreational drug users treated in a therapeutic community and its relationship to length of stay and outcome. *Journal of Personality Assessment*, 59(3), 515-527.

Fals-Stewart, W., & Lucente, S. (1994). Effect of neurocognitive status and personality functioning on length of stay in residential substance abuse treatment: An integrative study. *Psychology of Addictive Behaviors*, 8(3), 179-190.

Feigelman, W. (1987). Day-care treatment for multiple drug abusing adolescents: Social factors linked with completing treatment. *Journal of Psychoactive Drugs*, 19(4), 335-344.

First, M.B., Spitzer, R.L., Gibbon, M. & Williams, J.B. (1997). *Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I), Clinician Version*. American Psychiatric Press.

Gainey, R.R., Wells, E.A., Hawkins, J. D., & Catalano, R.F. (1993). Predicting treatment retention among cocaine users. *International Journal of the Addictions*, 28(6), 487-505.

Gossop, M., Marsden, J., Stewart, D., & Treacy, S. (2002). Change and stability of change after treatment of drug misuse 2-year outcomes from the National Treatment Outcome Research Study (UK). *Addictive Behaviors, 27*, 155-166.

Gossop, M., Stewart, D., Browne, N., & Marsden, J. (2002). Factors associated with abstinence, lapse, or relapse to heroin use after residential treatment: protective effect of coping responses. *Addiction, 97*, 1259 – 1267.

Grant, S., Contoreggi, C., & London, E. D. (2000). Drug abusers show impaired performance in a laboratory test of decision making. *Neuropsychologia, 38(8)*, 1180-1187.

Greenberg, W.M., Otero, J., & Villanueva, L. (1994). Irregular discharges from a dual diagnosis unit. *American Journal of Drug and Alcohol Abuse, 20(3)*, 355-371.

Hall, S.M., Havassy, B.E., & Wasserman, D.A. (1991). Effects of commitment to abstinence, positive moods, stress, and coping on relapse to cocaine use. *Journal of Consulting and Clinical Psychology, 59(4)*, 526-532.

Ha¨ttenschwiler, J., Ru¨esch, P., & Modestin, J. (2001). Comparison of four groups of substance-abusing in-patients with different psychiatric comorbidity. *Acta Psychiatr Scand, 104*: 59–65.

Heather, N., Rollnick, S. & Bell, A. (1993). Predictive validity of the Readiness to Change Questionnaire. *Addiction, 88*, 1667-1677.

Heatherton, T. F., Kozlowski, L. T., Frecker, R. C., & Fagerstrom, K. O. (1991). The Fagerstrom test for nicotine dependence: A revision of the Fagerstrom Tolerance Questionnaire. *British Journal of Addiction, 86*, 1119-1127.

Heitzmann, C. A., & Kaplan, R. M. (1988). Assessment of methods for measuring social support. *Health Psychology, 7(1)*, 75-109.

Higgins, S.T., Budney, A.J., Bickel, W.K., Hughes, J.R., Foerg, F., & Badger, G. (1993). Achieving cocaine abstinence with a behavioral approach. *American Journal of Psychiatry*, *150*, 763-769.

Hiller, M.L., Knight, K., Leukefeld, C., & Simpson, D. D. (2002). Motivation as a predictor of therapeutic engagement in mandated residential substance abuse treatment. *Criminal Justice & Behavior*, *29(1)*, Special issue: Making people change: The effectiveness of coerced psychological treatment. pp. 56-75.

Hubbard, R.L., Craddock, S.G., Flynn, P.M., Anderson, J., & Etheridge, R.M. (1997). Overview of 1-year follow-up outcomes in the drug abuse treatment outcome study (DATOS). *Psychology of Addictive Behaviors*, *11(4)*, 261-278.

Hughes, P.H., Coletti, S.D., Neri, R.L., & Urmann, C.F. (1995). Retaining cocaine-abusing women in a therapeutic community: The effect of a child live-in program. *American Journal of Public Health*, *85(8, Pt 1)*, 1149-1152.

Hutchison, L. (1996). Application of the transtheoretical model's stages and processes of change in predicting treatment attrition among substance abusers. *Dissertation Abstracts International*, *57(6)*, 2372-A.

Joe, G.W., Simpson, D.D., & Broome, K.M. (1998). Effects of readiness for drug abuse treatment on client retention and assessment process. *Addiction*, *93(8)*, 1177-1190.

Kazdin, A.E. (2003). *Research Design in Clinical Psychology; Fourth Edition*. Allyn & Bacon: Boston, MA.

Khantzian, E. J. (1985). The self-medication hypothesis of addictive disorders: Focus on heroin and cocaine dependence. *American Journal of Psychiatry*, *142*(11), 1259-1264.

Kleinman, P.H., Kang, S., Lipton, D.S., & Woody, G.E. (1992). Retention of cocaine abusers in outpatient psychotherapy. *American Journal of Drug & Alcohol Abuse*, *18*(1), 29-43.

Kruglanski, A.W., Shah, J.Y., & Fishbach, A. (2002). A theory of goal systems. *In: Advances in experimental social psychology*, Vol. 34. Zanna, Mark P.; San Diego, CA, US: Academic Press, Inc, pp. 331-378.

Lang, M.A., & Belenko, S. (2000). Predicting retention in a residential drug treatment alternative to prison program. *Journal of Substance Abuse Treatment*, *19*(2), 145-160.

Lawental, E., McLellan, A.T., Grissom, G.R. (1996). Coerced treatment for substance abuse problems detected through workplace urine surveillance: Is it effective? *Journal of Substance Abuse*, *8*(1), 115-128.

Leigh, B.C., & Stall, R. (1993). Substance use and risky sexual behavior for exposure to HIV: Issues in methodology, interpretation, and prevention. *American Psychologist*, *48*(10), 1035-1045.

Lejuez, C. W., Kahler, C. W., & Brown, R. A. (2003). A Modified Computer Version of the Paced Auditory Serial Learning Task (PASAT) as a Laboratory-Based Stressor. *Journal of Behavior Therapy and Experimental Psychiatry*, *26*(4), 290-293.

Leri, F., Bruneau, J., & Stewart, J. (2003). Understanding polydrug use: review of heroin and cocaine co-use. *Addiction*, *98*, 7-22.

Leshner, A.I. (1997). Introduction to the special issue: the National Institute on Drug Abuse's (NIDA's) drug abuse outcome study (DATOS). *Psychology of Addictive Behaviors, 11*(4), 211-215.

Lightsey, O.R., & Hulse, C.D. (2002). Impulsivity, coping, stress, and problem gambling among university students. *Journal of Counseling Psychology, 49*(2), 202-211.

Linehan, M.M. (1993). *Cognitive-behavioral treatment of borderline personality disorder*. New York, NY, US: Guilford Press.

Lundy, A., Gottheil, E., Serota, R.D., & Weinstein, S.P. (1995) Gender differences and similarities in African-American crack cocaine abusers. *Journal of Nervous & Mental Disease, 183*(4), 260-266.

Maglione, M., Chao, B., & Anglin, D. (2000). Residential treatment of methamphetamine users: Correlates of drop-out from the California Alcohol and Drug Data System (CADDSS), 1994-1997. *Addiction Research, 8*(1), 65-79.

Marlatt, G.A., & Gordon, J.R. (1985). *Relapse Prevention: Maintenance Strategies in the Treatment of Addictive Behaviors*. New York: Guilford Press.

Marlowe, D.B., Glass, D.J., Merikle, E.P., Festinger, D.S., DeMatteo, D.S., Marczyk, G.R., & Platt, J.J. (2001). Efficacy of coercion in substance abuse treatment. *In: Relapse and recovery in addictions*. Tims, Frank M. and Leukefeld, Carl G.; New Haven, CT, US: Yale University Press, pp. 208-227.

Marsh, J.C., & Miller, N.A. (1985). Female clients in substance abuse treatment. *International Journal of the Addictions, 20*(6 7), 995-1019.

- Matthews, K. A., & Stoney, C. M. (1988). Influences of sex and age on cardiovascular responses during stress. *Psychosomatic-Medicine*, *50*, 46-56.
- McConaughy, E. A., Prochaska, J. O. & Velicer, W. F. (1983). Stages of change in psychotherapy: Measurement and sample profiles. *Psychotherapy: Theory, Research, and Practice*, *20*, 368-375.
- McCusker, J., Bigelow, C., Vickers-Lahti, M., & Spotts, D. (1997). Garfield, F.; Frost, R. Planned duration of residential drug abuse treatment: Efficacy versus effectiveness. *Addiction*, *92(11)*, 1467-1478.
- McFarlain, R.A., Cohen, G.H., Yoder, J., & Guidry, L. (1977). Psychological test and demographic variables associated with retention of narcotic addicts in treatment. *International Journal of the Addictions*, *12(2 sup-3)*, 399-410.
- McLellan, A.T. (1983). Patient characteristics associated with outcome. *National Institute on Drug Abuse: Treatment Research Monographs, No 83-1281*, 500-529.
- McKay, J.R., Alterman, A.I., Mulvaney, F.D., & Koppenhaver, J. (1999). Predicting proximal factors in cocaine relapse and near miss episodes: clinical and theoretical implications. *Drug and Alcohol Dependence*, *56*, 67-78.
- Messina, N., Wish, E., & Nemes, S. (2000). Predictors of treatment outcomes in men and women admitted to a therapeutic community. *American Journal of Drug & Alcohol Abuse*, *26(2)*, 207-227.
- Miller, W. R., & Tonigan, J. S. (1996). Assessing drinkers' motivations for change: The Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES). *Psychology of Addictive Behaviors*, *10(2)*, 81-89.

Moos, R.H., & King M.J. (1997). Participation in community residential treatment and substance abuse patients' outcomes at discharge. *Journal of Substance Abuse Treatment, 14(1)*, 71-80.

Mulvaney, F.D., Alterman, A.I., Boardman, C.R., & Kampman, K. (1999). Cocaine abstinence symptomatology and treatment attrition. *Journal of Substance Abuse Treatment, 16(2)*, 129-135.

Nemes, S., Wish, E.D., & Messina, N. (1999). Comparing the impact of standard and abbreviated treatment in a therapeutic community: Findings from the District of Columbia Treatment Initiative experiment. *Journal of Substance Abuse Treatment, 17(4)*, 339-347.

Ouimette, P. C., Finney, J. W., & Moos, R. H. (1997). Twelve-step and cognitive-behavioral treatment for substance abuse: A comparison of treatment effectiveness. *Journal of Consulting & Clinical Psychology, 65(2)*, 230-240.

Prochaska, J. O. & DiClemente, C. C. (1982). Transtheoretical therapy: Toward a more integrative model of change. *Psychotherapy, Theory, Research, and Practice, 19*, 276-288.

Prochaska, J. O. & DiClemente, C. C. (1983). Stages and processes of self-change of smoking: Toward an integrative model of change. *Journal of Consulting and Clinical Psychology, 51*, 390-395.

Prochaska, J. O., Norcross, J. C., Fowler, J. L., Follick, M. J. & Abrams, D. B. (1992). Attendance and outcome in a work site weight control program: Processes

and stages of change as process and predictor variables. *Addictive Behaviors*, 17, 35-45.

Prochaska, J. O., Velicer, W. F., DiClemente, C. C. & Fava, J. (1988). Measuring processes of change: Applications to the cessation of smoking. *Journal of Consulting and Clinical Psychology*, 56, 520-528.

Quinn, E.P., Brandon, T.H., & Copeland, A.L. (1996). Is task persistence related to smoking and substance abuse? The application of learned industriousness theory to addictive behaviors. *Experimental & Clinical Psychopharmacology*, 4(2), 186-190.

Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, 1, 385-401.

Ravndal, E., & Vaglum, P. (1991). Psychopathology and substance abuse as predictors of program completion in a therapeutic community for drug abusers: A prospective study. *Acta Psychiatrica Scandinavica*, 83(3), 217-222.

Ravndal, E., & Vaglum, P. (1994). Self-reported depression as a predictor of dropout in a hierarchical therapeutic community. *Journal of Substance Abuse Treatment*, 11(5), 471-479.

Ravndal, E., & Vaglum, P. (2002). Psychopathology, treatment completion, and 5 years outcome: A prospective study of drug abusers. *Journal of Substance Abuse Treatment*, 15(2), 135-142.

Raynes, A. E., & Patch, V.D. (1973). Attrition at referral among heroin addicts. *International Journal of the Addictions*, 8(5), 839-846.

Robinson, K.D., & Little, G.L. (1982). One-day dropouts from correctional drug treatment. *Psychological Reports, 51*(2), 409-410.

Rutgers Alcohol Research Center. (1992). *The Intentions Questionnaire*. Piscataway, NJ: Rutgers, The State University of New Jersey.

Sanson-Fisher, R. W., Poole, A. D., & Dunn, J. (1980). An empirical method for determining an appropriate interval length for recording behavior. *Journal of Applied Behavior Analysis, 13*(3), 493-500.

Saunders, J.B., Aasland, O.G., Babor, T.F., & de la Fuente, J.R. (1993). Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption: II. *Addiction, 88*(6), 791-804.

Shah, J.Y., & Kruglanski, A.W. (2003). When opportunity knocks: Bottom-up priming of goals by means and its effects on self-regulation. *Journal of Personality & Social Psychology, 84*(6), 1109-1122.

Sheppard, D., Smith, G.T., & Rosenbaum, G. (1988). Use of MMPI subtypes in predicting completion of a residential alcoholism treatment program. *Journal of Consulting and Clinical Psychology, 56*(4), 590-596.

Shwartz, M., Mulvey, K.P., Woods, D., Brannigan, P.I., & Plough, A. (1997). Length of stay as an outcome in an era of managed care: An empirical study. *Journal of Substance Abuse Treatment, 14*, 11-18.

Shumate, M., & Worthington, E. L. (1987). Effectiveness of components of self-verbalization training for control of cold pressor pain. *Journal of Psychosomatic Research, 31*(3), 301-310.

Simpson, D.D., Joe, G.W., Broome, K.M., Hiller, M.L., Knight, K., & Rowan-Szal, G.A. (1997). Program diversity and treatment retention rates in the Drug

Abuse Treatment Outcome Study (DATOS). *Psychology of Addictive Behaviors*, 11, 279-293.

Simpson, D.D., Joe, G.W., & Brown, B.S. (1997). Treatment retention and follow-up outcomes in the drug abuse treatment outcome study (DATOS). *Psychology of Addictive Behaviors*, 11(4), 294-307.

Simpson, D.D., Joe, G.W., & Rowan-Szal, G.A. (1997). Drug abuse treatment retention and process effects on follow-up outcomes. *Drug and Alcohol Dependence*, 47, 227-235.

Sinha, R. (2001). How does stress increase risk of drug abuse and relapse? *Psychopharmacology*, 158(4), 343-359.

Siqueland, L., Crits-Christoph, P., & Gallop, R. (2002). Retention in psychosocial treatment of cocaine dependence: Predictors and impact on outcome. *American Journal on Addictions*, 11(1), 24-40.

Siqueland, L., Crits-Christoph, P., & Frank, A. (1998). Predictors of dropout from psychosocial treatment of cocaine dependence. *Drug & Alcohol Dependence*, 52(1), 1-13.

Snow, M.G., Prochaska, J.O., & Rossi, J.S. (1994). Processes of change in Alcoholics Anonymous: maintenance factors in long-term sobriety. *Journal of Studies on Alcohol*, 55, 362-371.

Stark, M. J. (1992). Dropping out of substance abuse treatment: A clinically oriented review. *Clinical Psychology Review*, 12(1), 93-116.

Stark, M.J., & Campbell, B.K.(1988). Personality, drug use, and early attrition from substance abuse treatment. *American Journal of Drug & Alcohol Abuse, 14*(4), 475-485.

Stone, A.A. (1981). The association between perceptions of daily experiences and self- and spouse- rated mood. *Journal of Research in Personality, 15*, 510-522.

Stotts, A.L., Schmitz, J.M., & Grabowski, J. (2003). Concurrent treatment for alcohol and tobacco dependence: Are patients ready to quit both? *Drug & Alcohol Dependence, 69*(1), 1-7.

Strong, D. R., Lejuez, C. W., Daughters, S., Marinello, M., Kahler, C.W., & Brown. (2003). The Computerized Mirror Tracing Task Version 1. Unpublished Manual.

Substance Abuse and Mental Health Services Administration (SAMHSA). (2002a). *Results from the 2001 National Household Survey on Drug Abuse: Volume I. Summary of National Findings* (Office of Applied Studies, NHSDA Series H-17, DHHS Publication No. SMA 02-3758). Rockville, MD.

Substance Abuse and Mental Health Services Administration (SAMHSA). (2002b). *ED Trends From DAWN: Final Estimates 1994 – 2001* (DAWN Series D-21, DHHS Publication No. (SMA) 02-3635). Rockville, MD.

Tellegen A. (1982). *Brief manual for the Multidimensional Personality Questionnaire*. Unpublished manuscript, University of Minnesota, Minneapolis.

Tellegen, A., Lykken, D.T., Bouchard, J., Thomas, J., Wilcox, K. J., Segal, N. L., Rich, S. (1988). Personality similarity in twins reared apart and together. *Journal of Personality and Social Psychology, 54*, 1031-1039.

Tennant, F., Shannon, J.A., Nork, J.G., & Sagherian, A. (1991). Abnormal adrenal gland metabolism in opioid addicts: Implications for clinical treatment. *Journal of Psychoactive Drugs*, 23(2), 135-149.

The Lewin Group. (1995). *Costs to Society*. Report funded by the National Institute on Drug Abuse and the National Institute on Alcohol Abuse and Alcoholism.

TOPPS-II Interstate Cooperative Study Group. (2003). Drug treatment completion and post-discharge employment in the TOPPS-II Interstate Cooperative Study. *Journal of Substance Abuse Treatment*, 25(1), 9-18.

Tutoo, D. N. (1971). Psychodiagnostic applications of the mirror tracing test. *Indian Educational Review*, 6, 293-303.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, 54, 1063-70.

Weisner, C. (1990). The role of alcohol-related problematic events in treatment entry. *Drug & Alcohol Dependence*, 26(2), 93-102.

Westreich, L., Heitner, C., & Cooper, M. (1997). Perceived social support and treatment retention on an inpatient addiction treatment unit. *American Journal on Addictions*, 6(2), 144-149.

Williams, J.B., Gibbon, M., First, M.B., & Spitzer, R.L. (1992). The Structured Clinical Interview for DSM-III-R (SCID): II. Multisite test-retest reliability. *Archives of General Psychiatry*, 49(8), 630-636.

Willoughby, F. W. & Edens, J. F. (1996). Construct validity and predictive utility of the Stages of Change Scale for alcoholics. *Journal of Substance Abuse*, 8,

275-291. Willoughby, S. G., Hailey, B. J., Mulkana, S. (2002). The effect of laboratory-induced depressed mood state on responses to pain. *Behavioral Medicine, 28*(1), 23-31.

Wills, T.A., & Hirky, A.E. (1996). Coping and substance abuse: a theoretical model and review of the evidence, in : Zeidner, M. & Edner, N.S. (Eds.) *Handbook of Coping. Theory, research, application*, pp. 279-302. John Wiley & Sons: New York, NY.

Zhang, Z., Friedmann, P.D., & Gerstein, D.R. (2003). Does retention matter? Treatment duration and improvement in drug use. *Addiction, 98*(5), 673-684.